March 2006

Apollo Seiko Soldering System

Selective Soldering System

Documentation Package – Table of Contents

1. **Start-Up Procedure**

2. **Teaching Pendant Description**

3. **Work Field Description – Solder Profile Data**

4. **L-CAT EVO Robot Programming (Apollo provided manual)**
   - 4.1 Solder Block Programming
   - 4.2 Solder Block Profile Sheet

5. **Preventing Solder Defects**

6. **Solder Feed Routing Detail**

7. **Soldering Principles / Concept & Solder Iron Set-Up**

8. **Basic Troubleshooting**

9. **Preventative Maintenance**

10. **Sponge Cleaner – Sponge Replacement**

11. **Spare Parts List**

Technical Advisory

Robot Start-Up Procedure

Aug. 17, 07

Step 01: Power on the L-CAT EVO robot in the lower left hand corner of the machine

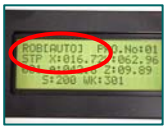
Step 02: Press the **HOME** key on the teaching pendant to **HOME** the robot. Once **HOME**, you will need to turn on the power to the iron unit

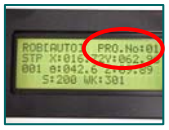
Step 03: Press the **ORANGE MODE** key on the teaching pendant three times until the display reads ROB [MANU]

Step 04: Press the ENTER key one time and check the SET TEMPERATURE. Set the temperature per the application requirement (300 ~ 420 Deg. C)

Step 05: Press the Heater ON key to turn on the temperature & iron unit

Step 06: Press the **ORANGE MODE** key again one time until the display reads ROB [AUTO]





Step 07: Make sure that the program number in the display reads Prog. 01

Step 08: Press the **ORANGE RUN** key to initiate a program sequence

Item to Check:

a) Make sure the air is on to the machine (required for operation)
b) Make sure that the POWER, ORIGIN and STAND-BY LED's are illuminated
c) Check the iron tip for wear prior to soldering
d) Check the sponges to ensure that they are saturated
e) Make sure that the upper line of the display shows the temperature of 360 Degrees Celsius

With Remote Interface Panel

Step 01: Power on the L-CAT EVO robot in the lower left hand corner of the machine

Step 02: Press the **HOME** key on the remote panel to **HOME** the robot. The iron unit power should start automatically.

Step 03: Press the HEATER key one time and check the SET TEMPERATURE. Set the temperature according to the application requirements (300 ~ 420 C) by using the UP/DOWN arrows on the robot interface

Step 04: Select the correct program number using the program selector (1-99)

Step 05: Press the GREEN START button to initiate a program sequence **The robot will be begin moving!**

Button Description:

START Initiates a program sequence or restarts after a STOP signal

P. STOP This is a partial stop signal which will stop the robot during running a sequence, START re-starts the robot

RESET Resets an error condition (temp error or solder clog)

HOME Homes the robot upon POWER UP

PROG Sel Select a program for operation (0-99)

E-STOP Stops the robot and kills power to the motors, a full system re-start is required after an E-Stop condition

Item to Check:

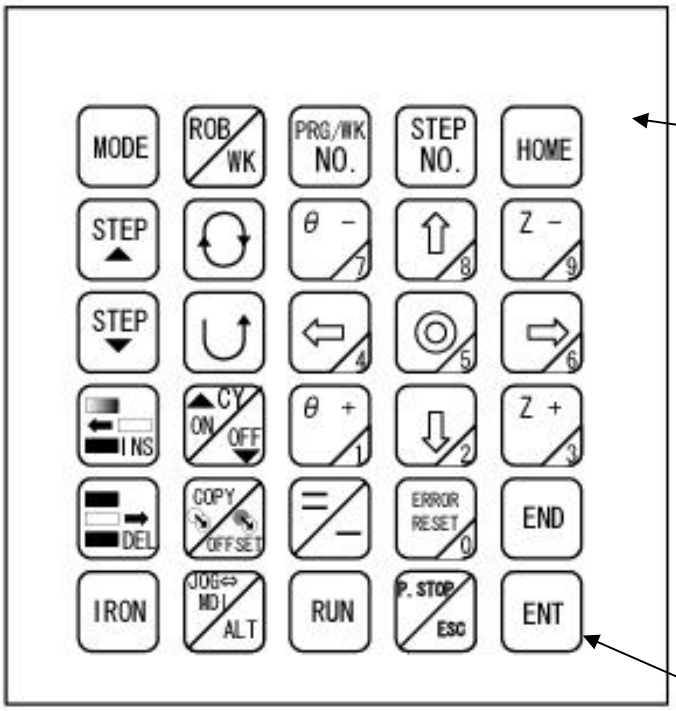
a) Make sure the air is on to the machine (required for operation)
b) Make sure that the POWER, ORIGIN and STAND-BY LED's are illuminated
c) Check the iron tip for wear prior to soldering
d) Check the sponges to ensure that they are saturated
e) Make sure that the upper line of the display shows the temperature of 360 Degrees Celsius

Technical Advisory

Aug. 17, 07

Teaching Pendant Explanation

A) Teaching pendant



HOME key
To initialize

ENT key
To enter the setting

Robot mode – Keypad Explanation

Key Label	Explanation
HOME	**To "home" the robot for initialization.**
MODE	**To select any of the modes listed below.** **[AUTO] for running production with the teaching pendant connected.** **[PROG] for programming and editing solder points.** **[STEP] for soldering each point one step at a time, profile spec. testing** **[TEST] for checking / amending position - no soldering to take place.** **[MANU] to move the robots (x, y, z and theta axis)**
ROB WK	**To select WK mode. The solder parameter can be programmed in the WK mode.**

To select the desired program and WK number.

Scroll through the program forward one step at a time.

Scroll through the program backwards one step at a time.

To delete/erase programmed points. Press twice to delete.

To insert a point into a program. Press once to enter the mode and press

Scroll through the WK parameter forward one step at a time.

Scroll through the WK parameter backwards one step at a time

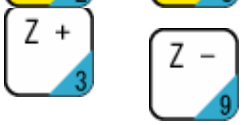
To select iron cylinder on and off (down and up).

To select copy or offset mode

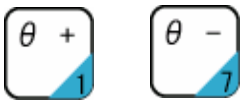
JOG keys to move the iron unit to the desired position and orientation.

To move X axis. In MDI mode, used to enter number.

To move Y axis. In MDI mode, used to enter number.



To move Z axis. In MDI mode, used to enter number.



To move theta axis. In MDI mode, used to enter number.

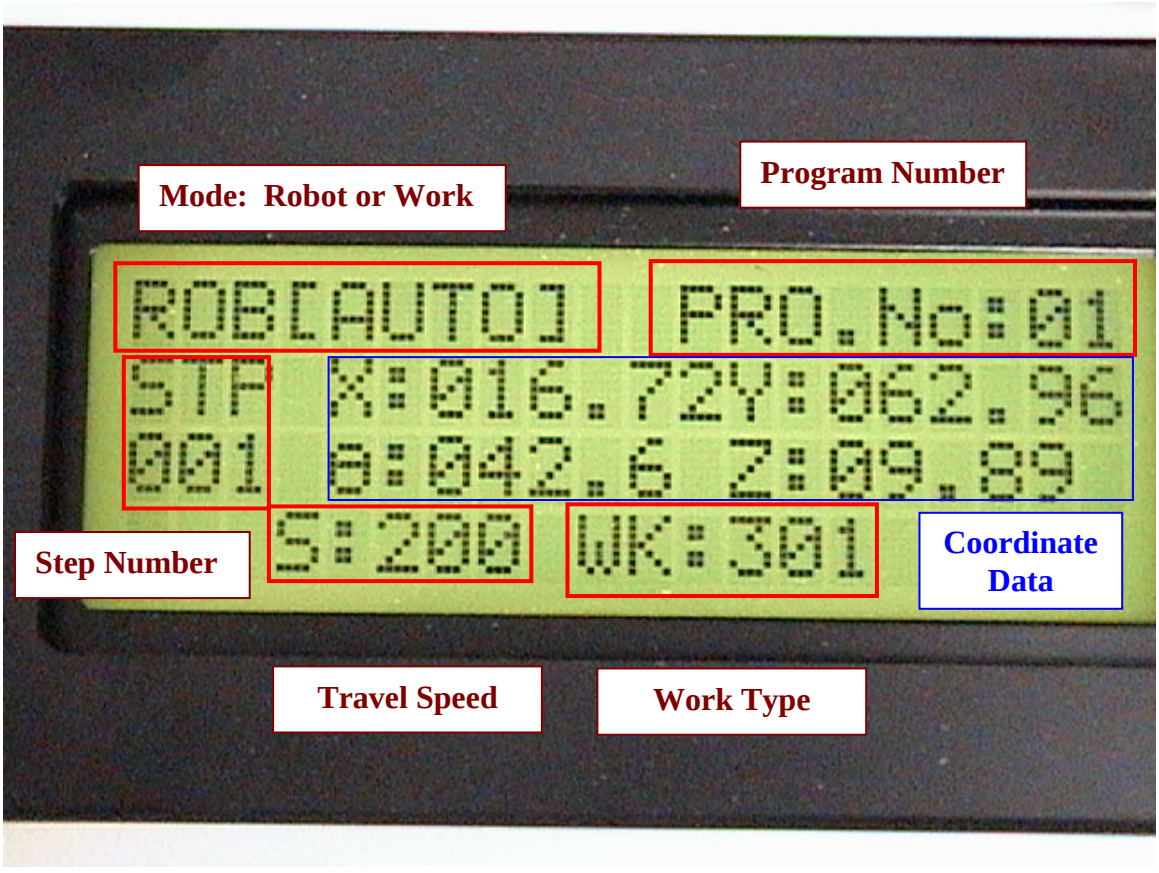
The alternative key to select the axes speed high or low if the machine is ROB (PROG) mode. The selected Jog speed is display L or H at the end of Z axis coordinate.(Z:00.0L, Z:00.0H). In MDI mode, used to enter number.

To reset an error. In MDI mode, used to enter number.

To extend/retract the iron tip. Pneumatic iron stroke is 10 mm.

Jog and MDI (manual data input) model selection. In WK mode, you can select second WK command group. Refer to the page 11.

Partial Stop. This will stop the robot before executing the next step. Enter [RUN] to start again. ESC key to escape the selection backward.



Solder Parameter Explanation

Solder WORK Profile Description Sheet (101, 102 & 103)

(Blocks 101~199 = Point Solder, Blocks 201~299 = Slide Solder, Blocks 301~399 = Special Condition)

21 Step Combination	WK _ _ _	WK _ _ _	WK _ _ _
S+ (solder pre-feed amount)			
CY 1 ON x.xx (iron tip extend & pre-heat timer)			
S+ (secondary solder feed)			
S- (solder retract amount)			
TIM (reflow timer)			
CY1 OFF (retract iron tip)			
End Condition	**END**	**END**	**END**

Notes:

Tip Part #: **Tip Temperature:**

Work Data:

Work Parameter Settings

Group 01:

S+	Solder Feed Forward (amount)
S-	Solder Feed Reverse (amount)
CY1 ON	Extend Air Cylinder (timer)
CY1 OFF	Retract Air Cylinder (timer)
TIM	Timer (general use)
END	End of Work Sequence
AIR	Air Blow (tip cleaning timer)
ACK	Slide Solder Timing Sequence
TEM	Tip Temperature Setting (degrees)

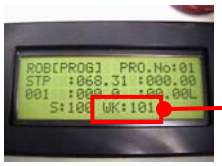
Group 02:

OUT	Output Signal (01 ~ 08 & duration
IN	Input Signal (01 ~ 08) & duration
SET	Turn On Output Signal
RST	Reset Output Signal (turn off)
WST	Wait for a Start Signal
JMP	Jump to Alternate Program, continue sequence without stopping
TE2	Second Temperature Setting “temp. alarm Off)
LDS (x x)	Turn on Laser Diode (wattage)
LDR	Reset (turn off) Laser Diode

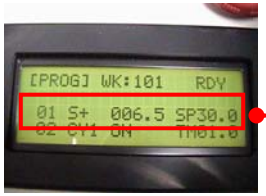
Sample Sequence:

S+ 2.5 25.0	**Feed 2.5 mm of solder @ 25 mm / sec.**
CY 1 ON 0.0	**Tip Extend**
TIM 0.5	**Timer of 0.5 Seconds**
S+ 3.0 10.0	**Feed 3.0 mm of solder @ 10 mm / sec.**
S- 3.0 25.0	**Retract solder by 3 mm @ 25 mm/sec.**
TIM 0.3	**Solder dwell time after feed 0.3 sec.**
CY 1 OFF	**Retract Iron Tip**
END	**End of Sequence**

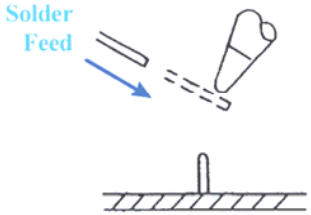
Apollo Seiko – WORK Field Explanation



WK: 101



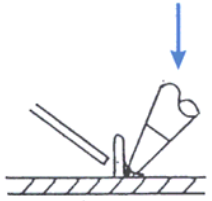
S+ Pre-feed 6.5 mm @ 30 mm/sec.



S+ - Initial Solder Feed

-- Initial Solder Feed Amount

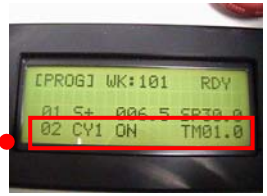
-- Solder Feed Speed (mm/sec.)



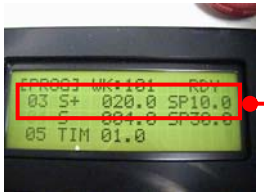
CY1 On & Timer

-- Iron Tip Extends Down (10 mm stroke)

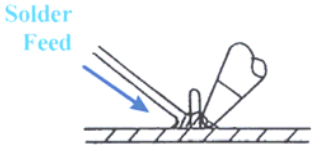
-- Pre-Heat Time (seconds)



CY 1 ON – Extend Tip
TIM – Pre-Heat for 1.0 second



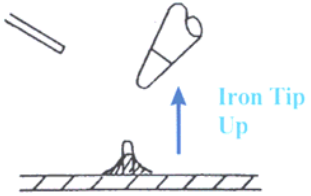
S+ Feed 20 mm @ 10 mm / sec.

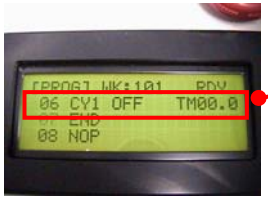


S+ - Secondary Solder Feed

-- Secondary Solder Feed Amount

-- Solder Feed Speed (mm/sec.)

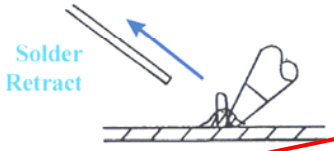




CY1 OFF – Retract Iron Tip No Timer

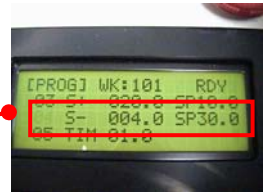
CY1 Off (retract iron tip)

CY 1 OFF retracts the iron tip for completion of WK cycle. Robot will move to next programmed location.

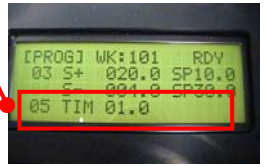


S- Solder Retract & TIM (reflow timer)

S- retracts the solder back away from the iron tip. **TIM** is a reflow timer. This tells the robot how long to leave the iron tip down to reflow the solder.



S- Retract Solder 4.0 mm @ 30 mm/sec.



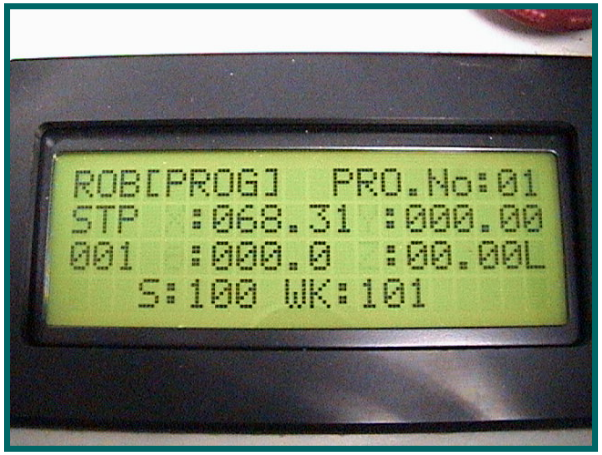
TIM – Reflow Timer Leave Iron Tip on Joint for 1.0 second

Note:

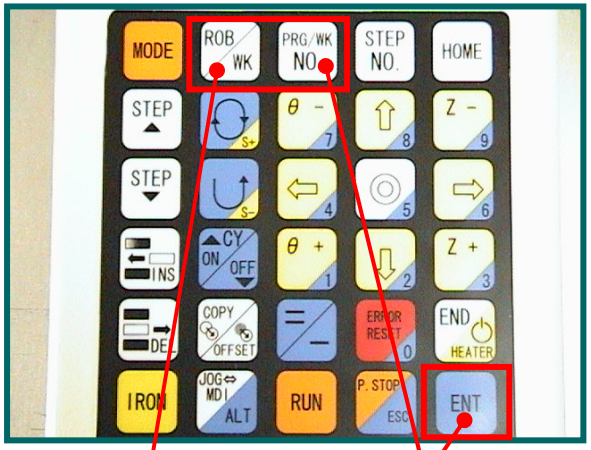
The above illustration is recommended for most through hole soldering operations, leads through plated or unplated through holes. There are, however, applications where this set-up may need to be modified slightly.

Applications such as very tall pins, large hole to pin ratio, component clearance applications etc. may require slight modification to this set-up.

Please contact Apollo Seiko technical support for optimal settings for your application(s).

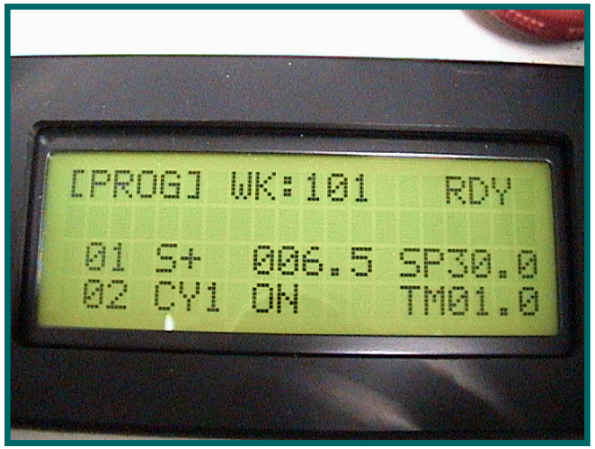


Teaching Pendant – ROB (robot) Mode

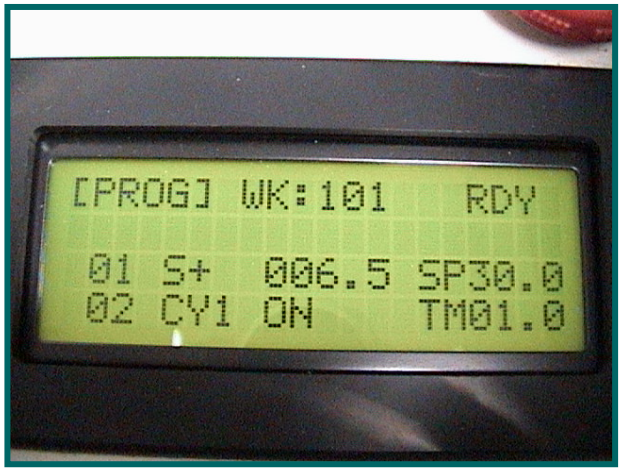


Press the ROB/WK key to Toggle Between ROB & WK Modes

Press the PRG/WK No. Key to Select the WK: number to modify and press ENTER



Teaching Pendant – WK (WORK) Mode
Photo Shows WK:101 (details below)

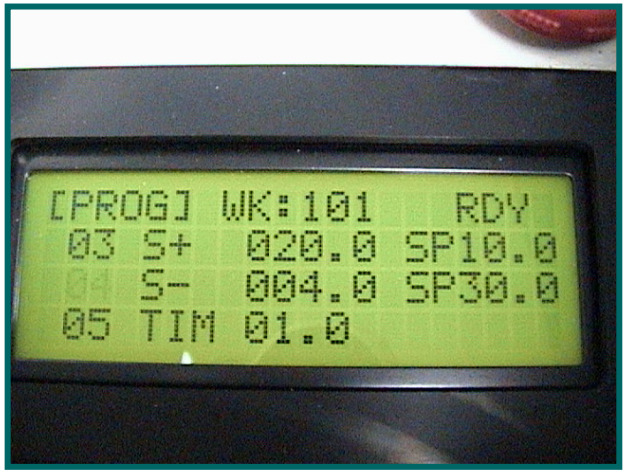


WK: 101 – Line 01

S+ = Solder Feed Forward 6.5 mm
@ 30.0 mm / sec.

WK: 101 - Line 02

CY1 ON – Extend Iron Tip
TM = Pre-Heat Timer for 1.0 second



WK: 101 – Line 03

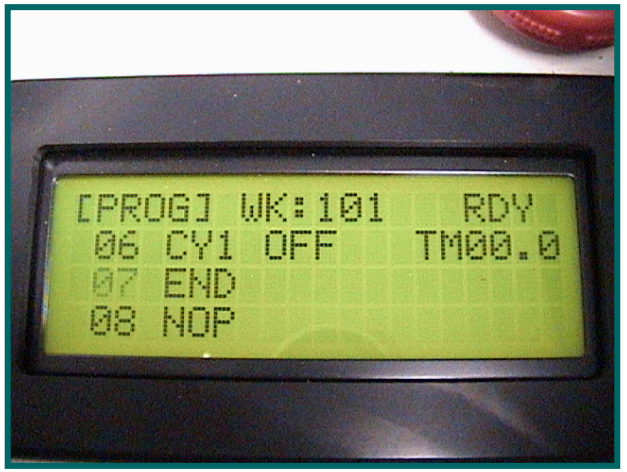
S+ = Solder Feed Forward 20.0 mm
@ 10.0 mm / sec.

WK: 101 - Line 04

S- = Solder Retract – 4.0 mm @ 30 mm/sec.

WK: 101 - Line 05

TIM = Reflow Timer for 1.0 second



WK: 101 – Line 06

CY1 OFF – Retract Iron Tip
TM = Timer for 0.0 second (timer not used)

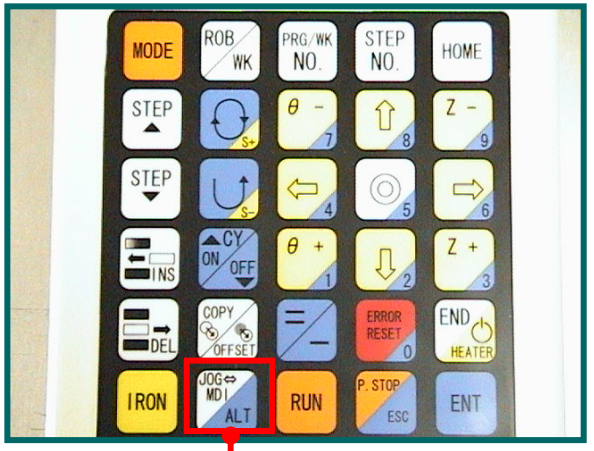
WK: 101 - Line 07

END – Each WORK must have an END step

WK: 101 - Line 08

NOP means NO POINT DATA

Programming WORK Field Data:



WK Parameter Command Description
Refer to the photos and pendant descriptions above for a detailed explanation.

Command list	WK data	WK data parameter	Description
Group #1 Parameters			
S+	***.*	SP***	Solder feeding forward, feeding amount ***.*mm, feeding speed ***mm/s
S-	***.*	SP***	Solder feed reverse, feeding amount ***.*mm, feeding speed ***mm/s
CY1	ON	TM***	Iron down and waiting time***sec..
CY1	OFF	TM***	Iron up and waiting time*** sec..
TIM	***.*		Time delay *** sec.
END			WK step end
AIR	**.*		Air blow *** sec.
ACK			When sliding, ACK(acknowledge) signal gives the machine the slide stating timing
TEM	***		Temperature setting. The command turns on heater power and sets solder temperature.
			WK command to do the step in the same time
Group #2 parameter (Press the ALT key to access this parameter group. (#1-#2 #2-#1)			
OUT	*	TM***	External I/O output signal *** sec.
IN	*		External I/O input signal waiting
SET	*		Turn on output signal
RST	*		Turn off output signal
WST			Wait the start signal
JMP			Jump to other program to run multi programs without stopping
TE2	***		Temperature setting without a waiting “temperature alarm off”.
LDS	***		Start (turn off) LD with ***A (5-42A).
LDR			Reset (turn off) the LD.

An example to enter WK 101 for point soldering

Command	WK: Data1	WK: Data 2	Description
S+	6.5	SP 30.0	6.5mm @ a feeding speed of 30mm/s
CY1	ON	TM 1.0	Iron down and 1.0 sec time delay (pre-heat)
S+	10.0	SP10	Iron up and waiting time*** sec. afterward
S-	3.0	SP50.0	
TIM	1.0		Heating time 1.0 sec.
CY1	OFF	TM0.0	Iron up
END			WK step end

An example to enter WK 201 for slide soldering

Parallel WK	Command List	WK Data 1	WK Data 2	Description
	S+	5.0	SP50.0	5.0mm, feeding speed 50mm/s
	S-	3.0	SP50.0	3.0mm, reverse speed 50mm/s
=	CY1	ON	TM0.5	Iron down and 0.5 sec time delay
=	ACK			
	S+	20.0	SP5.0	20.0mm, feeding speed 5 mm/s
	S-	3.0	SP50.0	3.0mm, reverse speed 50mm/s
	TIM	0.5		Time delay 0.5 sec.
	CY1	OFF	TM0.0	Iron up
	END			WK step end

Note:

Parallel WORK means that you can execute two rows in a sequence simultaneously

WK 301 for Iron Tip Cleaning

TIM	0.5	0.5 sec wait time (tip lowered into sponges)
END		WK step end

WK 501 Waiting for an Input Signal (potential conveyor lift station etc.)

IN 01	0.1	0.1 sec. (100 millisecond signal)
END		

Solder Parameter Explanation

WORK Profile Worksheet

(Blocks 101~164 = Point Solder, Blocks 201~264 = Slide Solder, Blocks 301~364 = Special Condition)

21 Step Combination	WK _ _ _	WK _ _ _	WK _ _ _
End Condition	END	END	END

Notes:

Tip Part #: **Tip Temperature:**

Work Data:

Work Parameter Settings

Group 01:

S+	Solder Feed Forward (amount)
S-	Solder Feed Reverse (amount)
CY1 ON	Extend Air Cylinder (timer)
CY1 OFF	Retract Air Cylinder (timer)
TIM	Timer (general use)
END	End of Work Sequence
AIR	Air Blow (tip cleaning timer)
ACK	Slide Solder Timing Sequence
TEM	Tip Temperature Setting (degrees)

Group 02:

OUT	Output Signal (01 ~ 08 & duration
IN	Input Signal (01 ~ 08) & duration
SET	Turn On Output Signal
RST	Reset Output Signal (turn off)
WST	Wait for a Start Signal
JMP	Jump to Alternate Program, continue sequence without stopping
TE2	Second Temperature Setting “temp. alarm Off)
LDS (x x)	Turn on Laser Diode (wattage)
LDR	Reset (turn off) Laser Diode

Sample Sequence:

S+ 2.5 25.0	**Feed 2.5 mm of solder @ 25 mm / sec.**
CY 1 ON 0.0	**Tip Extend**
TIM 0.5	**Timer of 0.5 Seconds**
S+ 3.0 10.0	**Feed 3.0 mm of solder @ 10 mm / sec.**
S- 3.0 25.0	**Retract solder by 3 mm @ 25 mm/sec.**
TIM 0.3	**Solder dwell time after feed 0.3 sec.**
CY 1 OFF	**Retract Iron Tip**
END	**End of Sequence**

EVO Error Listing

This table is designed to help trouble shoot common problems that may occur with the L-CAT EVO. If you have tried the recommended solution and the problem persists, please contact APOLLO SEIKO directly for technical support.

Error Display on the EVO Front Panel

Display	Description	Recommended Solution
E01	Home position moving error	Check air supply, sensor position and connections.
E02	Position detection error	Press RESET key and start. If it happen again, check the mechanical movement. WK000=137 142 *1
E03	Cylinder up/down sensor error	Check air supply, sensor position and connections.
E04	External input waiting error	Check an external equipment. and the connections.
E05	Communication error	Turn off the power and turn it on again.
E06	Temperature error	The iron cartridge or the connection faulty. Turn off the power and check the connection or change the iron cartridge.
E07	N/A	N/A
E08	Data check error	The date entered may be out of the moving range. *2
E09	Upper sensor limit error	Air is not supplied to the machine. Check the air supply.
E10	Camera data error Camera setting No. error.	Press RESET key and start If it happens again. Check the camera setting.
E11	Camera capture error Capture range our of 10mm.	Press RESET key and start. If it happens again, put the work within 10mm.
E12	Communication error (LYPE Laser type)	EVO to Laser communication error (1sec). Turn off the power and turn it on again.

*** 1** **If the WK000=140 (Position Deviation Check in the End) setting is OFF, a restart can not be done if/when the E02 error occurs.**

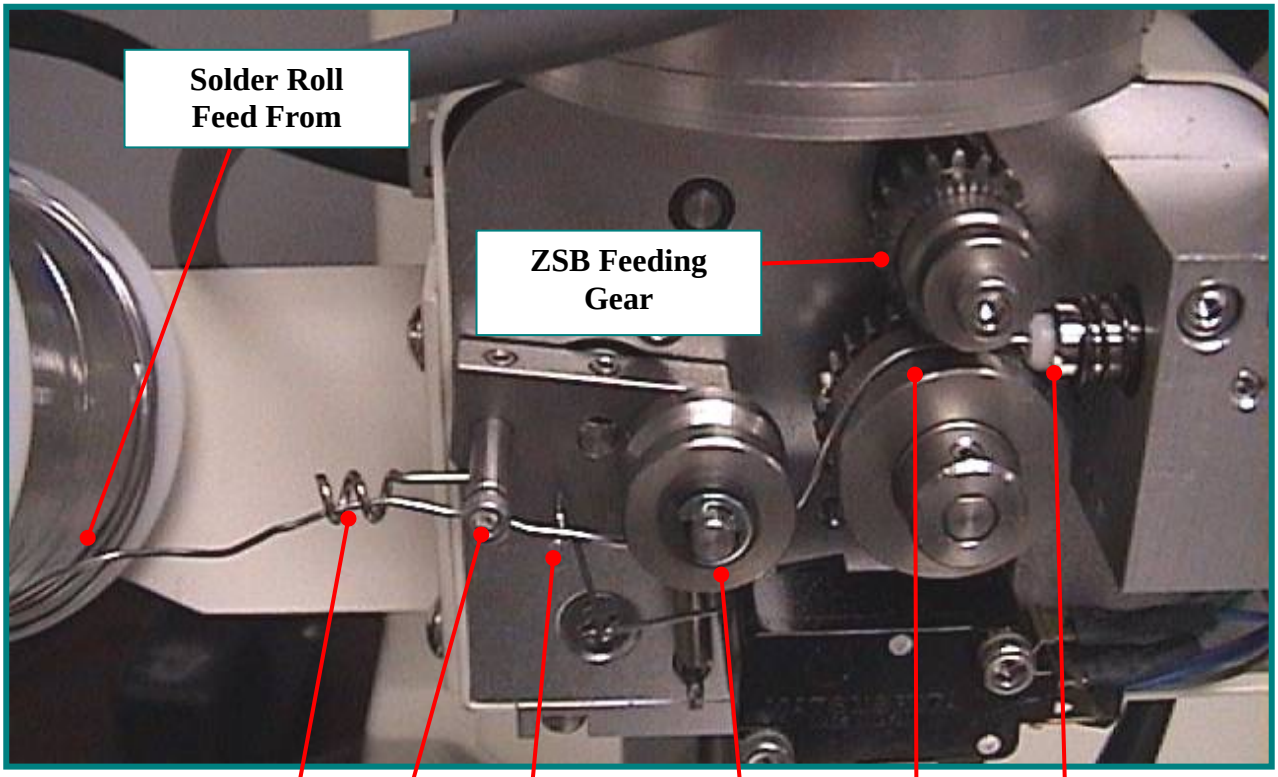
*** 2** **The error check data is the out of the axes soft limit.**

APOLLO SEIKO

Technical Advisory

Aug. 17, 07

Solder Feed Routing - ZSB



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Clearance Requirements – Keep Out Area (general guidelines)

Clearance requirements are a function of the specific solder iron to be utilized. The specific solder joint configuration and its thermal mass are the primary considerations for choosing the appropriate solder iron tip design. Solder can be delivered to the PCB as flux-cored wire or placed as a preform. Factors to be considered for determining clearance requirements are: direction of solder iron approach, solder delivery method, type and size of neighboring components.

This scope of this document does not cover all of the allowable shapes and sizes of soldering tips for different applications. It is a guideline for considering different options in the development of PCB layout and process flow.

Clearances are measured from the edge of the pad to be soldered to the component body.

Neighboring components LESS than 5mm vertical height.

Includes SMT components and low profile sticklead components. Minimum clearance is 2.0mm from the side of pin array or 1.5mm from the end of the array. As component height increases, the clearance increases. See Figure 1 and Figure 2 below.

Keep out expansion for taller components:

Part Ht.	Keep Out
1mm	2mm
2mm	2.5mm
3mm	3mm
4mm	4mm
5mm	5mm
>5mm	Consult Mfg. Eng.

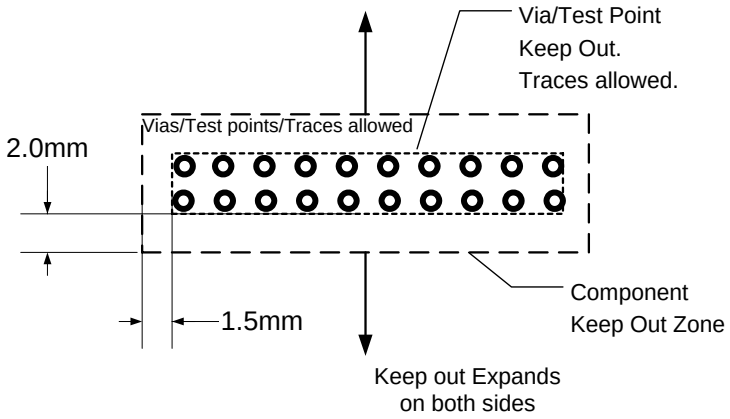


Figure 1 Keep Out Zones for Soldering Iron

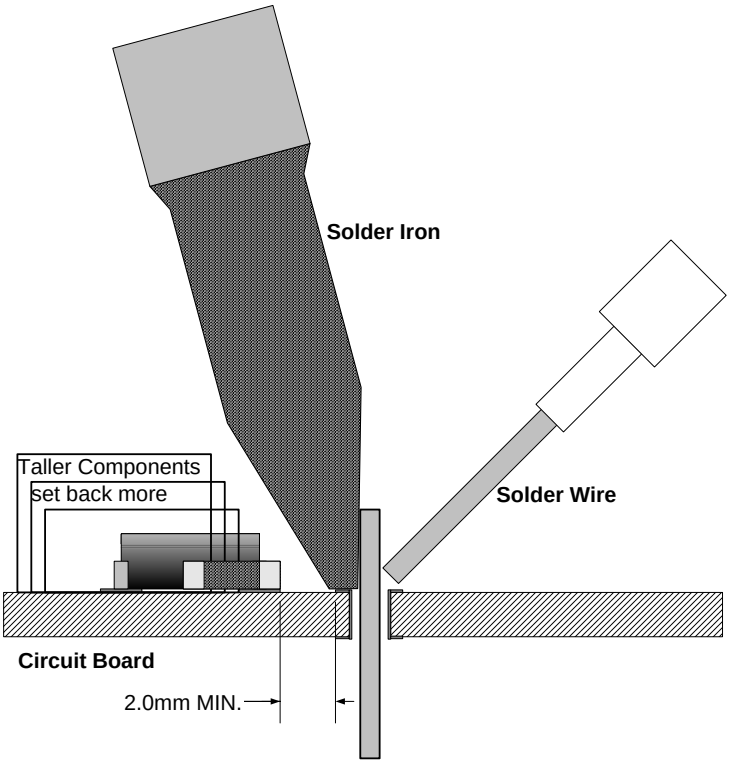


Figure 2 Solder Iron and Solder Wire Approach

Soldering Principles – Set-Up Description

Apollo Seiko has designed this robotic soldering system (Model L-CAT EVO, Luna, Terra) around the soldering principles of an efficient hand soldering operation. The soldering steps are as follows:

Step 01:	Introduce flux to remove any oxidation & clean the surface
Step 02:	Feed a small amount of wire to assist in "wetting"
Step 03:	Pre-heat the joint
Step 04:	When the joint is hot enough, feed additional solder to allow for a solid electrical, mechanical connection
Step 05:	Retract the solder wire
Step 06:	Maintain heat to the joint until solder flows as desired
Step 07:	Repeat process

With hand soldering an operator has the dexterity to move the solder wire where it is needed. In a robotic environment, the process is not as flexible but is very consistent. **Solder feed set-up is the most critical process of the entire system.** If the solder feed system is not set up properly, solder joint quality will always be compromised.

Solder Wire: Example wire specification:

Alloy	SAC 305
Diameter	.032" (0.8 mm)
Flux	No-Clean # 245
Flux Percentage	P3 (3.3%)

The Apollo Seiko selective soldering systems can feed a wide variety of solder diameters. The minimum diameter is 0.5 mm (0.020") up to 1.6 mm (0.064"). The solder is fed into one solder feed tube from the reel. The feed tube is a 2-part tube. The outer sleeve is Nylon and the inner sleeve is Teflon. The Teflon inner sleeve is designed to be solder diameter specific. For example, when using 0.031" diameter wire, the inside diameter (ID) is approx. 0.004" wider than the wire. This prevents the solder wire from bending, kinking and mis-feeding.

In order to change solder wire diameter you must change the following items:

a) Solder Feed Tube b) Manually Adjust Feed Roller Distance

ZSB Feeding System:

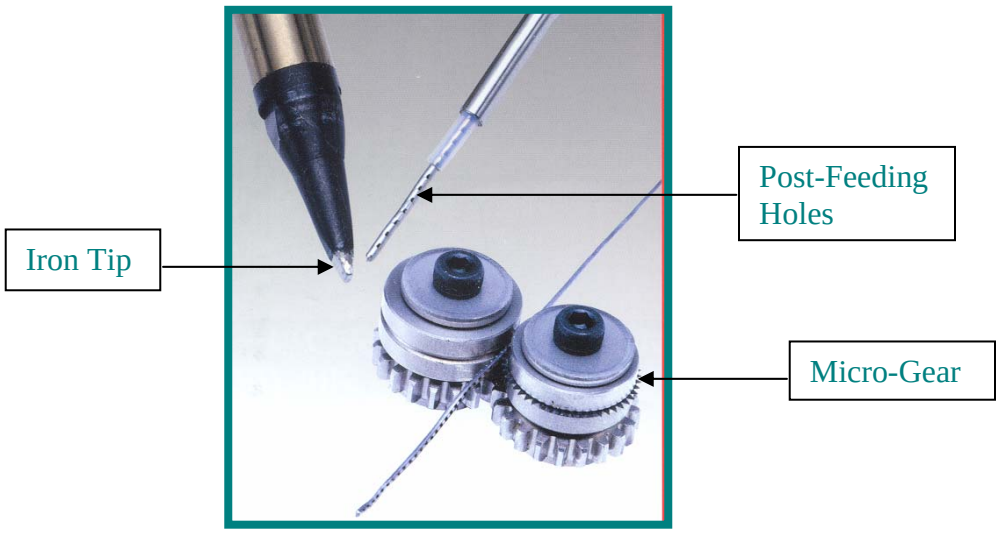
The feeders that have been installed on your soldering robots are known as **ZSB (Zero Solder Ball)** feeders. The concept of the ZSB feeder is to reduce the occurrence of solder balls.

The feed rollers have a micro-gear that penetrates the solder wire to the flux core. The additional benefit of this feeding system is very precise solder wire feeding. **This feeding system is NOT available with solder wires with a diameter larger than 1.6 mm.**

Solder Ball Formation:

Most solder wire has a flux core (paste). This flux has a boiling point of 120 degrees Celsius. Eutectic solder wire has a melting point of 183 degrees Celsius. With a standard "pinch roller" feeding system, the flux inside the solder wire starts to boil as the solder approaches the heat source (iron unit). Once the solder melts, the boiling flux must outgas. This micro-explosion causes the molten solder to create minute solder balls. Solder balls & flux spatter can cause electrical "shorts" between sensitive components. Lead-free solder has a higher melting temperature (normally between 216 ~ 222 degrees Celsius).

The ZSB feeding system (pictured below) allows the flux to disperse evenly through the punctured solder wire. As the wire approaches the iron tip the flux heats up and expands. This liquid flux escapes through these holes and allows for very localized flux dispersion and almost eliminates the solder ball phenomenon.

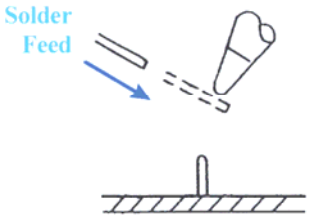


ZSB Feeding System

The following page illustrates the proper set-up of the solder feeding system. Apollo Seiko utilizes a dual feeding principle for each solder joint. This minimizes cycle time while optimizing solder quality.

Also listed in this illustration are the corresponding solder parameters of the solder block. Each smaller illustration may consist of one or more solder block / profile operations.

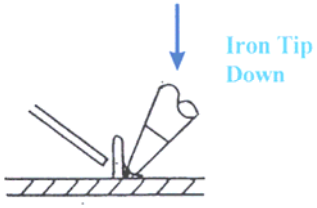
Apollo Seiko Recommended Solder Feeding Procedure



S+ - Initial Solder Feed

-- Initial Solder Feed Amount

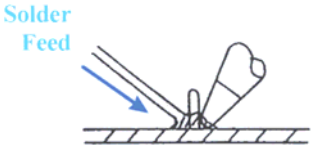
-- Solder Feed Speed (mm/sec.)



CY1 On & Timer

-- Iron Tip Extends Down (10 mm stroke)

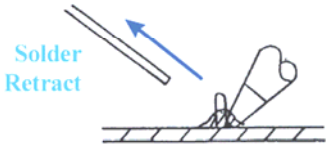
-- Pre-Heat Time (seconds)



S+ - Secondary Solder Feed

-- Secondary Solder Feed Amount

-- Solder Feed Speed (mm/sec.)

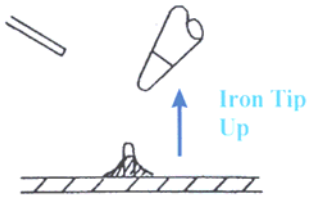


S- & CY1 Off Timer

-- Re-Flow Time

-- Solder Retracts Automatically

-- Retract Amount Set *(block 0, op. 3)*



Iron Unit Retracts - Point Soldering

-- System Controlled

-- Once Solder Cycle is Complete

Note:

The above illustration is recommended for most through hole soldering operations, leads through plated or unplated through holes. There are, however, applications where this set-up may need to be modified slightly.

Applications such as very tall pins, large hole to pin ratio, component clearance applications etc. may require slight modification to this set-up.

Please contact Apollo Seiko technical support for optimal settings for your application(s).

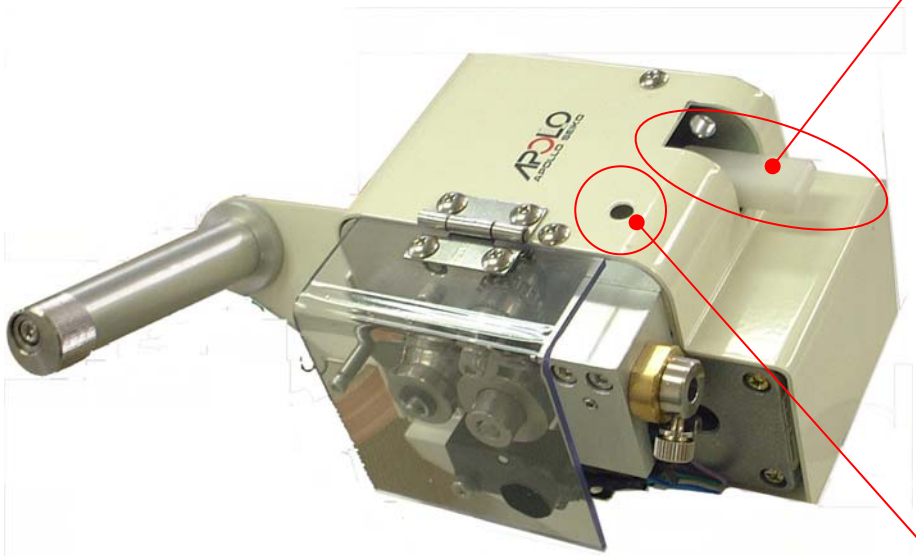
Note: Please refer to the solder profile sheet for this application. The above parameters will explain at what point during each individual soldering cycle that pre-heating is done, solder is being fed, solder is being re-flowed etc.

For example, CY 1 ON (above) is the pre-heating portion of the cycle.

Adjusting Solder Feed Tension

Date: **Feb. 07'**

Lower the Solder Feed Engage Lever to Allow Access to Feeder Tension Adjustment



Rotate the set screw inside cover counterclockwise (CCW) to tighten tension and clockwise to loosen feed roller tension

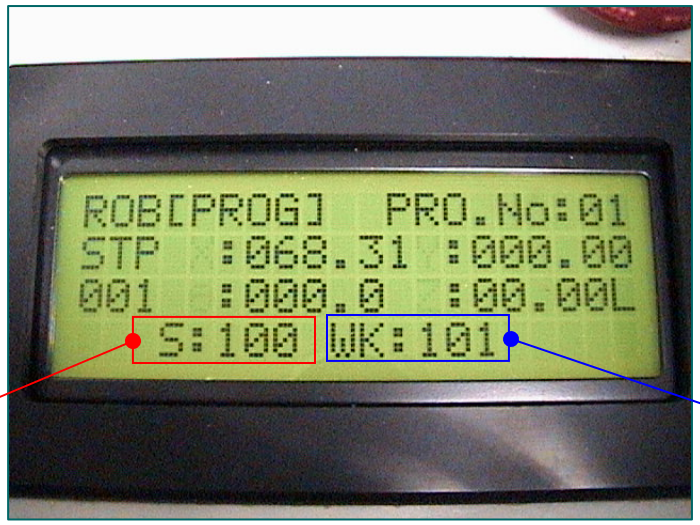
Feed Roller Gear Close-Up (tension adjustment controls tension on these two feeder components)

ZSB Roller Access Holes

ZSB Feeding System

How to Modify the Soldering Position

1) In the teach pendant, select PROG mode.
2) Select the correct program number that you want to modify.
3) Select the step number 1, then press RUN. The robot will move to the first programmed position. If this is the position you want to modify then step 5).
4) If this step number is not the position you want to modify then use the STEP up button to step number 2 and press RUN again. The robot will go to next position. If this is also not the position you wish to modify, repeat 4). It makes sense to move through the program step by step to minimize any head crash possibilities but you can actually select any step in the program with the step up or down key an press RUN to move to that step. The WORK field will help you identify what step you will be going to. For instance, if there is a WK: 2 x x you know this is for slide soldering and that is the MSB connector.
5) When the robot finally reaches the position that you wish modify. For example, it's step position number 6. The teach pendant will show: STP 6. Now, you can use the JOG key (the yellow arrow keys) to move the iron to the desired position. Use the IRON button to extend and retract the Iron tip for aim to the correct position.
6) After you have move the Iron tip to the correct position, then you can press the ENT button. You will se the cursor blinking on SP: 300. If you wish to change the speed at this time you can key in the new number (1-750mm/s) and press ENT. If not, just simply press ENT and the cursor will go to WK: 1x x. This is the sub-program for soldering parameter which normally never changes. So, just press on the ENT until you se the screen change to next step. STP7
7) Repeat the step 6) if you have other step to modify. If not, just press MODE button. The teach pendant will show a message of **"Wait ….. writing".** Then, the teach pendant screen will change to STEP mode. That's mean you have successful save the new position into robot memory.



Speed Field
1 mm ~ 750 mm per second

Work Field
WK 1xx – Point
WK 2xx - Slide

Technical Advisory

Aug. 17, 07

Solder Qualtiy Factors

Solder feed & iron position location is very important to achieve consistent solder quality. The solder wire position in relation to tip location and PCB height can be the difference between consistently good solder joints and marginal results.

Point Soldering: (Tip Photo - DCS 60 DV-1)

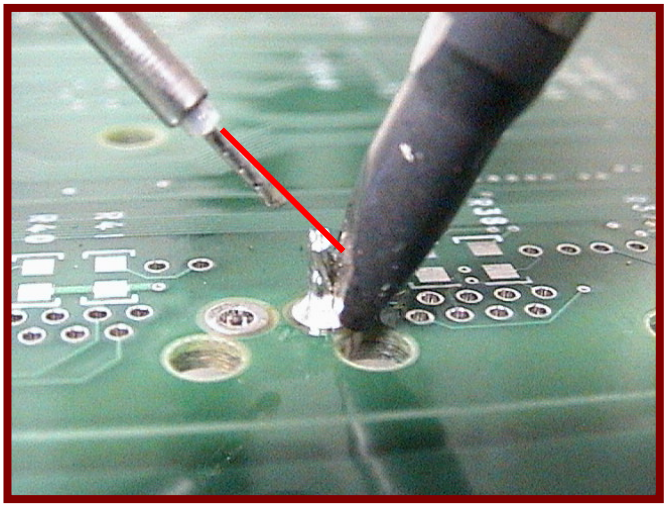
Point soldering is much more forgiving than slide soldering. It is important that the iron tip make contact with both the PCB pad and (if possible) the terminal that you are soldering. Many times the terminals may not be perfectly straight or at the exact same angle. This will cause issues with the iron tip contacting the terminal only and not the pad creating poor heat transfer. For most applications, the terminal / lead position can vary slightly. The tip is programmed to the inside edge of the plated through hole to compensate for the lead variation. The large tip profile allows for excellent thermal transfer even though the tip may not be in direct contact with the terminal.

Solder Feed:

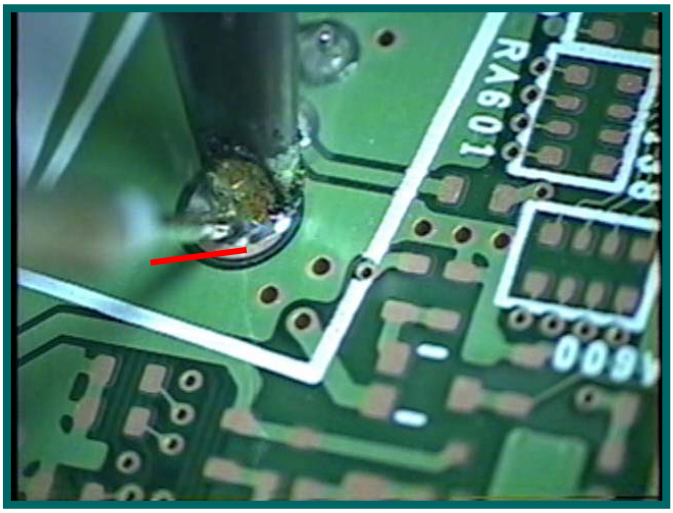
The solder feed height in the photo below is a little higher than recommended. By feeding the wire in this high position there are opportunities for two potential issues:

Solder Jam: The wire may hit the top of the terminal causing a solder clog error condition

Solder Void: The solder may want to stay with the iron tip and not migrate to the joint, this lack of solder can produce a void. Typically, the next joint will have excess solder when this occurs.



Point Solder – Feed too High
Potential Void



Point Solder – Feed into Joint
Correct Position

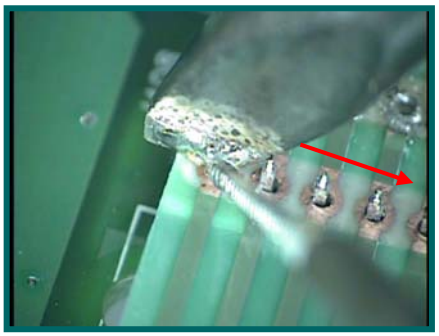
Slide Soldering: (Tip Photo - DCS 50 R)

Slide soldering requires the iron tip and terminal relationship to be **very consistent**. Optimal results are achieved when the iron tip make contact with both the solder pad and the terminals. Also, the iron tip should have a slight "**OPEN**" angle to minimize the potential for solder bridging (photo next page). During movement, the iron tip should contact all of the leads for the best possible heat transfer.

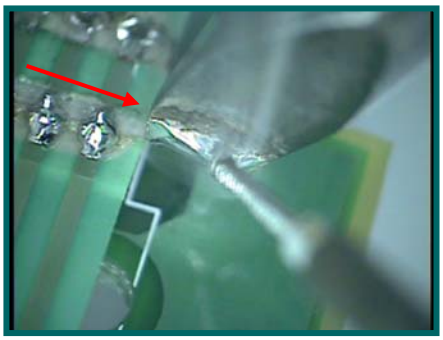
The sliding speed and feed rate are programmable. Normal sliding speeds range between 3 mm / second & 5 mm / second.

Iron Tip Programmed Location:

The iron tip position is very important at both the start and finish of a connector row. The photos below illustrate the proper location for iron tip position.



Start Position – Tip Location
Iron Tip 50% on past first pin



End Position – Tip Location
Slide past last pin

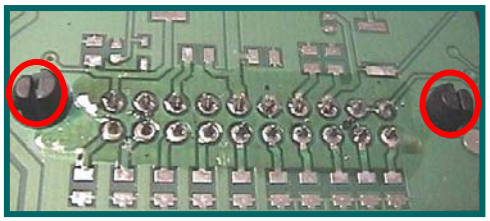
Solder Feed:

The solder feed height in the photos above is correct. The feed height should be located to the center of the iron tip (top to bottom) of the tin electroplate area. This ensures that the solder will melt on contact and wett as evenly as possible. A higher or lower feed height can cause the following issues:

Low Feed Height: The wire may hit the terminals and deflect away from the tip, therefore not melting
High Feed Height: The solder may contact the black plating on the tip causing inconsistent melting and can actually prevent wetting to the Tin electro-plated area

Some applications do not allow for the tip to slide past the last terminal of a connector such as a plastic snap-lock etc. or a component in close proximity. In this case, the tip must be programmed to stop on the last terminal

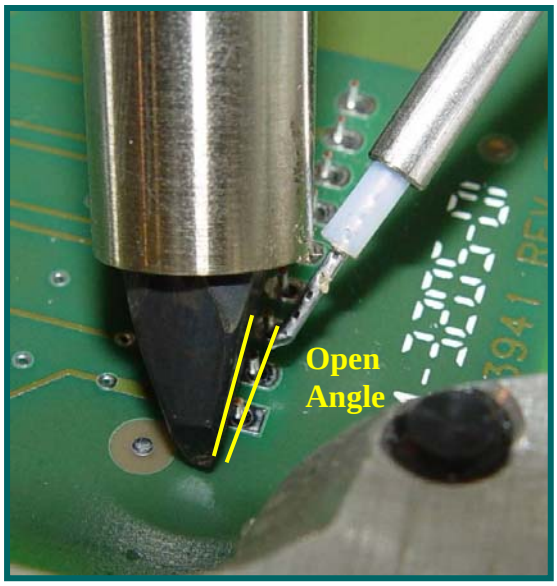
For some applications, there may be components or plastic parts that prevent the iron tip from sliding past the last terminal. In this case, you must stop the tip on the last terminal (photo lower right). This can sometimes cause the solder to "**SPIKE**" upon removal. It is important to determine the correct amount of time to leave the tip down to prevent a solder spike from occurring.



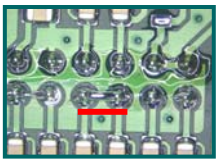
Plastic Snap-Lock Prevents
Iron tip from sliding past the last terminal

Iron tip programmed
to stop on the last terminal

The iron tip is programmed with a slight "**OPEN**" angle. This allows the front of the tip to contact each terminal and the rear edge of the tip to heat each pad as the tip slides. The "**OPEN**" angle minimizes the possibility for bridges to occur as the entire tip surface never contacts two pins simultaneously.



Slide Solder Defects:

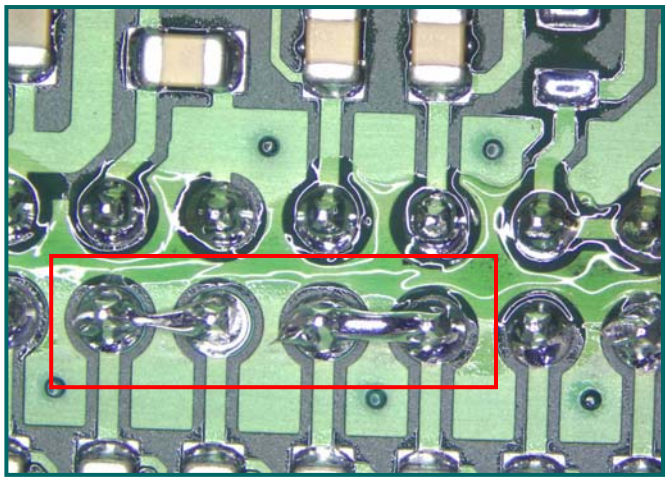


Solder "Shorts" or "Bridges":

There are several factors that can contribute to a solder short or bridge. These factors include:

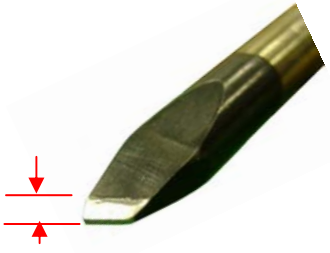
- **a) Flux void in wire core**
- **b) Wire feed position**
- **c) Iron tip position**
- **d) Inconsistent lead location**
- **e) Iron tip temperature**
- **f) Oxides, residual flux on tip (post clean)**

If the robot is soldering well and then the quality becomes poor, the main reason is that something has changed in the set-up. Most likely, the solder wire feed position has been accidentally moved or mis-adjusted or was loose and has drifted out of position. Prior to making any programming changes, check the set-up of the tip and feed position to ensure that they are correct.



Poor flux distribution on PCB. This was caused by feeding solder too high on the tip above the Tin electroplate, this caused the flux to burn away and become in-effective. This problem was fixed by lowering the feed position.

The solder feed height in the photo above illustrates the proper height setting for feeding into a slide solder tip.



The solder feed needs to contact the Tin electro-plated area of the iron tip. Solder feed heights above this area can cause major quality issues.

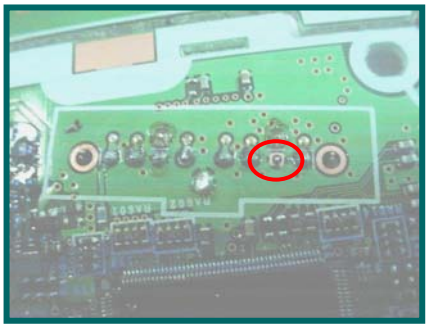
Point Solder Voids:

Insufficient solder, also referred to as a "VOID" can be caused by several factors. These factors include:

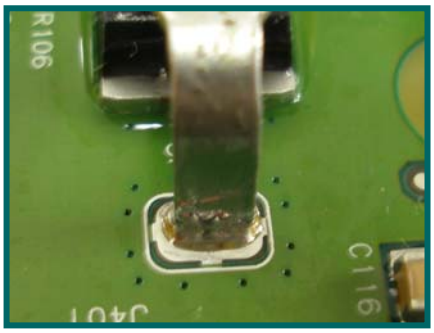
a) Flux void in wire core **b) Wire feed position**

c) Iron tip position **d) Burnt flux build-up on tip**

e) Oxidized pad or terminal **f) Poor thermal transfer (iron tip hole or worn plating**



Solder Void
Total missed joint, tip may have hit top of terminal



Incomplete Coverage
poor thermal transfer from tip to terminal
possible worn tip or hole in tip

Iron Tip Issues:

The iron tips should be changed on a schedule rather than waiting until there are issues with solder quality. Counter should be installed to determine the amount of cycles that each tip has soldered. Once a pre-determined life has been set, the tip should be changed to prevent soldering issues from occurring.

Iron tips have a Tin electro-plate area on them. Over time, the feeding of the solder wire, the flux in the solder as well as temperature and the terminal that the tip is contacting all have a negative impact on tip life. Below are photos of a new tip and a badly worn tip with a hole worn in it.

Burnt flux residue can also negatively impact solder quality and create potential void situations. The iron tips should be manually cleaned once per hour to remove the burnt flux residue (photo in center below). When the flux builds up on the tip, it can actually prevent the tip making good contact with a terminal due to the flux making contact with the terminal and not the tip surface.

When the plating wears or a hole has built up on the tip, the thermal "mass" of the tip is lost, which in turn causes poor heat transfer. Changing the iron tip on a scheduled basis *will prevent this from happening*.

New BCV-1 Tip
Clean Lines & Plating

Burnt Flux Residue
Build-Up All Around Tip

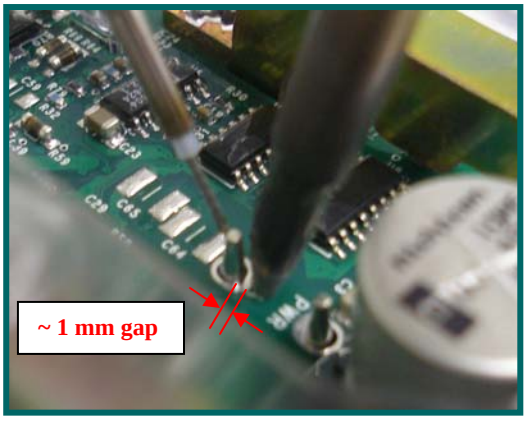
Tip with Hole Worn
Loses Thermal "Mass"

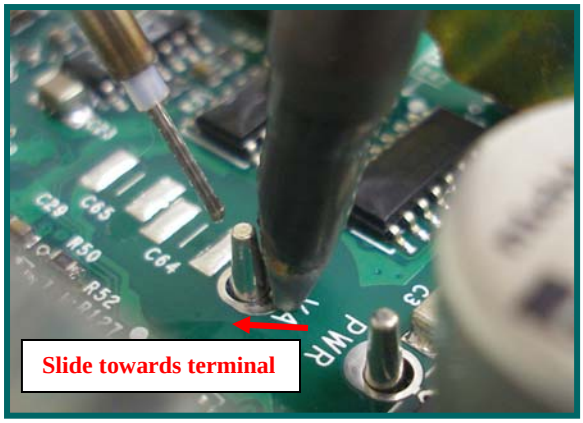
Technical Advisory

Slide Into Pin / Terminal

Aug. 17, 07

The L-CAT EVO can be programmed to slide into a terminal to avoid the tip coming into contact with the terminal in the case that it may be bent. This is accomplished by programming the joint as a slide solder joint vs. a point solder. The slide solder programming takes two steps per joint. A **START** step and an **END** step. The table & photos below will help illustrate the programming locations and steps.





Slide Step 01:

The iron tip should be programmed approx. 1 mm away from the pin or on the edge of the pad. This is done to compensate for any angle that the pin / terminal may be leaning. When programming a slide solder step, you will see a set of brackets **[ ]** in the WORK field. These brackets are for a programmed delay to allow the solder to start feeding prior to the tip moving. The table below shows a delay of 0.3 seconds. A delay setting of 0.1 ~ 0.3 should work for your application

Slide Step 02:

The second step of the slide should be programmed in the normal location that you would program the tip for point soldering. The iron tip will move towards the terminal between steps 01 & 02. You will also need to program a slide speed. A speed of 5 ~ 15 mm / second should be programmed to allow the iron tip to move towards the terminal at a slow rate of speed to prevent any damage to the iron tip, terminal or solder mask. The rate of speed to be programmed for slide step 01 should be the normal speed of approx. 250 mm/sec

Step	X	Y	Z	Theta	Speed	WK No.	DLY	End
Slide Step 01	361.00	130.32	25.3	275.6	250	201	03	
Slide Step 02	361.00	131.32	25.3	275.6	5	200		

Slide step 1 programmed Y location 1 mm from terminal

Slide step 2 programmed Y location 1 mm closer

Slide speed = 5 mm / sec.

Slide solder profile = 201

Feed delay of 0.3 seconds

End of slide solder sequence is always 200

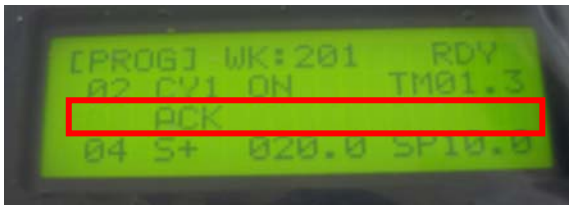
Solder Profile Description

The photos below show the solder WORK profile for a standard slide solder profile. All slide solder profiles need to use work profile numbers between 201 & 299. The second half of each slide solder sequence will have a default WK value of 200. This is system generated and cannot be changed. This tells the robot that this programmed location is the END of the slide sequence.

The screen to the left shows steps 01 & 02 of solder work profile WK: 201.

Line 01 is the S+ (solder feed forward) which is programmed the same as a point solder profile

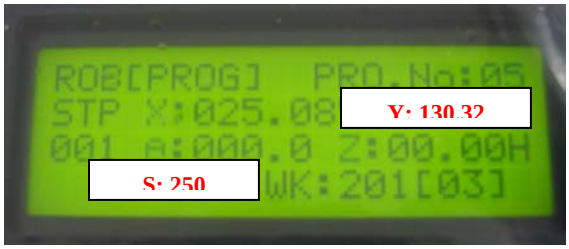
Line 02 is the programmed pre-heat time (CY1 ON TM 1.3), same as for point solder as well.



The screen to the left shows steps 03 & 04. The main difference between programming a point and slide solder profile is the addition of the ACK command. The ACK command is an acknowledgement to the robot that tells the system that this is a slide solder profile and the iron tip is to stay down during the movement of step 01 & step 02 of the slide sequence.

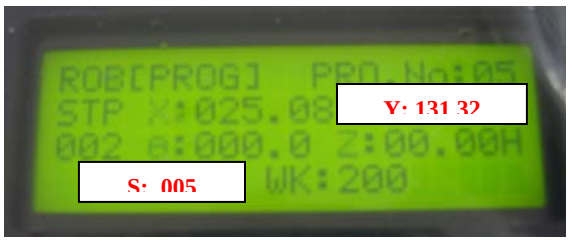
Please note that the ACK command should be placed as above in the sequence (between steps 2 & 3). If this is programmed in a different logical sequence the robot can react strangely.

This screen to the left shows the remaining steps of the slide solder profile. These are programmed exactly the same as with a point solder profile.



This screen to the left shows the programming for the first step of the slide solder process. Notice that the "Y" axis has a setting of 130.32.

Also the slide speed (S:250) has the normal programmed speed of 250 mm / second. The WK: field has a setting of WK: 201 [03]. This tells the robot that we will be using slide solder profile 201 and a feeding delay of 0.3 seconds



This screen to the left shows the programming for the second step of the slide solder process. You will notice that the "Y" axis is programmed with 131.32 This is 1 mm from the first programmed point in step 001 above. The 1mm distance is a recommendation but your specific application may require slightly less or more.

The slide speed for the second point has been changed to 5 mm / sec from the step above which was programmed with 250 mm / sec

Slide Solder Tips

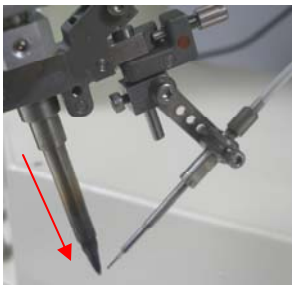
Item #	Description
01	Slide soldering is programmed in a sequence of two steps. The first step is the starting point and the second step is the end point.
02	The first step should be programmed approx. 1 mm away from the terminal. This distance allows for any "lean" that the terminal to be soldered may have.
03	The first solder step is programmed with a work profile in the WK 201 ~ WK 299 range. The 2 X X series tells the robot that this will be a slide solder profile.
04	The second programmed step is programmed to touch both the anular ring and the terminal to be soldered. The work profile for the final step of each slide defaults to WK: 200 and cannot be changed.
05	When the first slide solder step is programmed, as soon as the WK: 2 X X is entered, a set of brackets [ ] appear. A number has to be entered at this time. This bracketed field is a timer delay to allow for feeding solder prior to moving. The purpose of this is to allow the solder to start feeding so that it contacts the tip as opposed to contacting the terminal. If the solder were to contact the terminal first, it may not melt since the terminal is not hot enough as the iron tip is not touching it. A normal programmed delay time for this type of sliding is 01 ~ 03 =. The setting of [01] means a delay of 0.1 seconds.
06	The ACK command (acknowledge) is programmed for all slide solder operations. The purpose of this ACK command is to tell the robot that you are slide soldering. Program the ACK command in the solder profile as specified on page 02 (between lines 02 & 04)
07	When slide soldering, it is important to match the solder amount (S+) with the feed speed. The meaning of this is that if the programmed solder volume has been fed, the tip will retract. In the case of "short" slide soldering as in the photo on page 01, normally you will not see this occur. If it were to occur you can prevent this by either slowing down the feed rate (S+ 4.5 SP 10.0), slow down the 10.0 mm / sec. to 7.5 or 5.0
08	The same amount of solder feed should be programmed for slide soldering as for point soldering
09	When you use the delay feature and are feeding a small amount of solder wire length, the feed may be exhausted and cause the iron tip to raise up prematurely, please refer to step 07 to remedy this situation
10	Keep the programmed slide speed between 5 mm / sec. & 15 mm / sec., this will prevent damage or premature wear to the iron tip or solder mask

Changing the Iron Tip (RS-L & RS-P):

1) Switch off the robot power (highly recommended) or switch off the Heater in MANU mode by pressing the HEATER button in the teach pendant.

2) Wait until the Iron tip is at room temperature (approx. 3 minutes).

3) Spray some Flux remover where the iron tip meets the cartridge holder. This will help to loosen the flux residue which built at the iron tip and the iron tip cartridge.



4) Pull the Iron tip out from the cartridge along the same angle of the iron cartridge. The iron tip should be easy to pull out after apply the flux remover. Remember don't twists or turn the iron tip. If the iron tip is still difficult to pull out from cartridge, repeat step number 4.

5) After removing the iron tip, use flux remover to clean the internal cartridge with a cotton swab. (Clean only 1/3 depth into the iron tip cartridge, do not spray flux remover into the iron tip cartridge)

6) Select the correct iron tip **DCS/DCN**, check for the locator key and 4 sharp connecting points at the back of iron tip. If the iron tip is missing the locator key, please do not use.

7) Put the new iron tip into the iron tip cartridge, first push the iron tip into the end and feel the locator position, then apply a small pressure to push the iron tip into the snap grip.

8) Turn on the robot power or switch ON from MANU mode by pressing the Heater button on the teach pendant.

9) The display panel will show the temperature increase and iron tip will heat up to the set temperature.

RS-P & N2 RS-P Iron Unit for Point Soldering

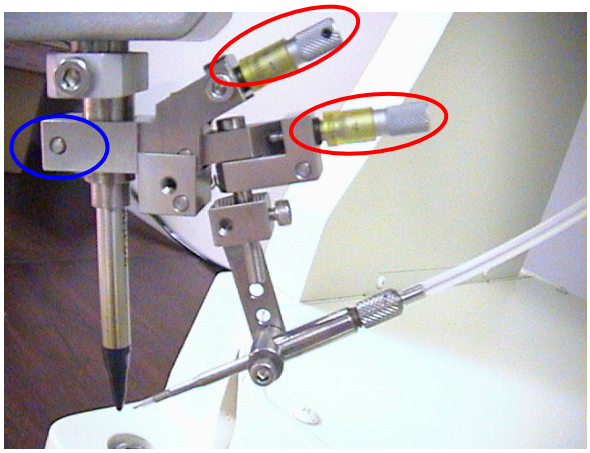
Solder Feed Angle:

The solder feed approach angle should be between 45 & 60 degrees from horizontal. There are also 4 holes on the tube holder. This will set the feed angle per the application requirement.

Solder Feed Height:

Initial solder feed to be positioned just under the iron tip. This will prevent the solder wire from feeding directly into the iron tip plating and wearing the tip prematurely. Once the initial feed is set, you can then set the 2nd feed position. The goal is to feed into the joint area and not to the tip itself.

Solder Feed Up/Down & Left/Right Adjust



Solder Feed Adjust:

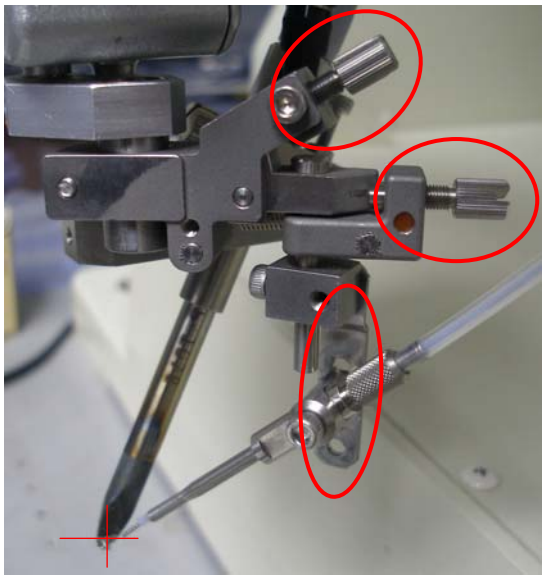
To adjust the height of the solder feed, use the upper micrometer to raise or lower the height.

To adjust the solder feed left to right, use the lower micrometer to direct solder to the desired location.

Feed Assembly Rotation:

On the opposite side of the iron (blue oval) is a set screw. Loosening this screw allows the entire feed assembly to be rotated into the correct position for soldering.

RS-L & N2 RS-L Iron Unit for Slide Soldering



Solder Feed Angle & Location:

For slide soldering, the solder wire should be directed towards the center of the iron tip plated area for both left to right & up / down. The solder feed approach angle should approximately 45 degrees. There are also 4 holes on the tube holder. This will help set the feed angle per the application requirement.

Iron Mounting & Approach Angle:

The iron mounts to the robot with a 10 mm diameter collar. The head can be rotated 360 degrees. Once positioned, this is held in place by tightening the bolt to compress the mounting collar. There is no keyway.

There is a radius “arm” that sets the iron approach angle. There is also a bolt that allows the entire assembly to rotate until the desired angle is achieved. The goal is to keep the tip base parallel to the PCB surface.

Solder Feed Up/Down & Left/Right Adjust

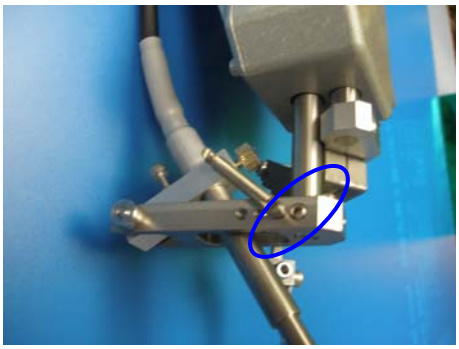
Solder Feed Adjust (photo left):

To adjust the height of the solder feed, use the upper micrometer to raise or lower the height.

To adjust the solder feed left to right, use the lower micrometer to direct solder to the desired location.

Feed Assembly Rotation (Photo below):

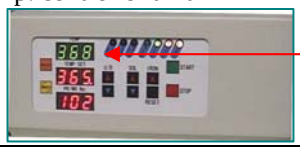
Loosening this set screw allows the entire feed assembly to be rotated into the correct position for soldering.



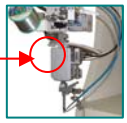
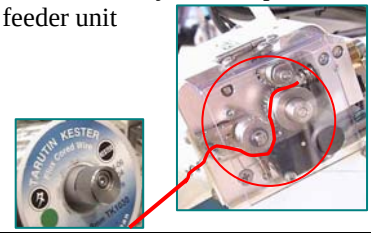
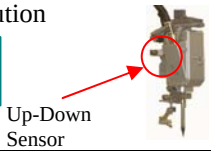
Technical Advisory

Aug. 17, 07

Robot & Solder Troubleshooting

Machine Problem	Item(s) To Check For
The L-CAT EVO robot will not power on	Check to see that the fuse in the rear of the robot base is not blown. If so replace with a 5 amp fuse. Also check that the power cord is connected to an electrical outlet (110 V)
The robot is not moving and an amber light is illuminated	The amber light will light up when a non-tragic error condition is encountered. There are three error LED's on the front panel of the robot. The error conditions that may be encountered here are temp. error, end of solder reel (solder shortage) & solder clog. A front door interlock "break" intrusion will also create a stoppage of movement. Clear the error condition, press the black reset button on the front panel of the L-CAT EVO robot and then press the start button to resume soldering.
The temperature controller has all "----" displayed in the top line of the temp. controller unit 	The solder iron tip is either "shorted" out internally or there is a problem with the temperature controller. Turn the power to the controller off and then first change the solder tip. Power back on and see if the problem persists. If so, replace the TTM 104 controller module. The module is easily removed by pressing the small plastic lock on the bottom front of the unit. The entire internal controller slides out for fast, easy replacement.
The robot is running but no solder is feeding	It is possible that the tension of the feed rollers is not set tight enough. The tension adjustment set screw is located under the front cover (shown here with cover still on) . Loosen the three Phillips head screws and remove the cover, adjust the set screw to set the proper tension. Replace the cover& screws and resume soldering. There may also be a solder jam condition. There is an internal sensor to sense a solder jam. However, some times smaller diameter solder wire may not "trip" this sensor. The robot feeder can still feed without creating a "jam" error condition.
The temperature on the temperature controller is fluctuating and not stable	There are a couple of reasons that this problem is occurring. The first is that the iron tip is at the end of it's useful life. Replace the iron tip with a new one according to the tip changing instructions in this manual. The second possibility is that the iron cable is bad. This cable connects the solder iron to the front panel of the L-CAT EVO robot. One end (control panel side) is a snap-on connector, the iron unit side is a screw on connector. Power the robot off and replace the cable with a new one.
Solder is not melting properly when being fed to the iron tip / PCB	The solder feed adjustment is mis-aligned. Follow the set-up procedure in the manual (this section). The illustration shows proper solder feed set-up.

Troubleshooting (cont.)

The iron tip is moving fine but the X, Y, Z & Theta coordinates do not seem to line up with the programmed solder location	It is possible that a set screw on the drive gear(s) may be loose. Remove the Z axis cover (4 screws) and tighten all metric set screws, remove the X axis front cover plate (under Apollo logo) and tighten set screw on drive gears and remove Y axis cover plate (behind Z axis cover) and tighten set screws as necessary. The solder program may need to be fine tuned.
The teaching pendant is connected to the robot but the robot will not execute a program automatically	Normally the teaching pendant should be removed during normal operation. During testing etc. it may be necessary to have the pendant connected. The pendant must be in the ROB [AUTO] mode in order to execute a program. Press the **ORANGE MODE** key until the LCD reads as above.
The iron tip is moving up or down too slowly or too quickly Flow control valves (around rear of iron) 	There are up & down flow control valves for the speed of the iron tip cylinder. Loosen the thumb screw for the upward & downward movement cylinders, adjust accordingly and re-tighten the locking thumb screw. Another possibility is that the iron unit has become full of flux residue. Clean the iron unit according to the maintenance section of this manual and follow all preventative maintenance guidelines.
The solder feed assembly is out of position therefore causing solder feed errors	Tighten all set screws on solder feed assembly. The small micrometer adjusts the solder feed position for left / right as well as up / down The picture to the right shows the micrometer adjustment
Solder wire is jammed up in the feeder unit 	Disengage the solder feed lever. Remove the solder with small pliers, tweezers etc. and cut the solder wire so that the end is cut clean. Re-feed the wire through the inlet nozzle and into the feed tube. Engage the feed lever, replace the cover & it may be necessary to press the reset button on the front robot LED panel. The **RED LINE** shows the correct path for the solder to feed. Always mount the solder reel so that the solder feeds from the bottom of the roll and not over the top. See photo for detailed view.
The iron unit does not retract after soldering and/or the **"RUNNING"** LED remains illuminated during program execution  Up-Down Sensor	The RS-P / RS-L iron units have up & down "drum" sensors. The purpose of the sensor is to prevent the robot from moving until the iron tip has been fully retracted. Check the position of the sensor, it may have become loose due to vibration. Adjust the sensor height so that it is within it's working range (approx. 4 mm range). There are LED's on the sensors. Once the sensor is on position the iron should retract and/or the RUNNING LED will turn off and STANDBY will be illuminated. The RUNNING & STANDBY lights will toggle on & off during each solder cycle during normal operation.
The solder is not feeding according to the feed set-up illustration. The iron unit is not extending (over-travel) during each cycle Locking set screw (1.5) Stopper adjustment	During normal solder operation, the iron tip extends slightly further down than the solder feed tube. This is referred to as over-travel. There is one set screw on the iron unit that controls the amount of over-travel. There is a 2.5 mm set screw (side of iron) to adjust the "Hard Stop" that sets the over-travel amount (see photo – left). Loosen the set screw and then adjust the stopping set screw on the bottom of the iron unit. When the iron is in the down position you will see the solder feed position move according to the height of this set screw.
Solder Shortage Error End of Reel	At the end of a roll of solder, there will be an error alarm and an LED illuminated. This tells the operator that it is time to change the solder roll.

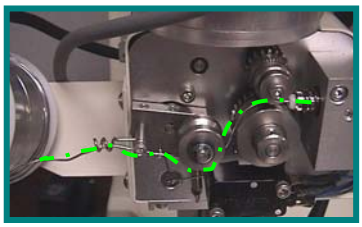
Preventive Maintenance

The majority of the maintenance of the L-CAT EVO soldering system will be with the soldering feed, iron tips & the iron units. Flux fumes are the main cause for required daily and semi-annual maintenance.

This system includes the Apollo Seiko recommended fume extraction system. It is strongly recommended that a localized fume extraction system be installed on each robot. **The fumes must be removed at the point of soldering and not vented only from the top.**

Daily

Maintenance Task	Description
Clean Solder Feed Tube (Daily)	Disconnect white solder feed tube(s) from the feeder unit by unscrewing the tube. Using compressed air, blow out any solder debris inside the feed tube. Replace feed tube.
Iron Tip Tinning (Daily)	Prior to turning off the iron unit, it is suggested to tin the iron tip with solder and then turn the unit off. This will help extend the overall life of each tip by preventing oxidation.
Solder Replacement (as needed)	Once a solder reel has been exhausted, you must replace it with a new one. There will be approx. 24" of solder left from each reel.



Disengage the feed rollers and pull the unused solder from the feed tube. Install a new reel on the holder and feed manually until the solder reaches the feed rollers and into the second tube. Make sure the solder gets fed on top of the sensor arm to ensure the robot will not sense a solder empty condition. Engage the feed rollers and use the solder advance button to feed to the tip (teach pendant or top panel*). If the teaching pendant is connected, the top panel buttons do not function. They function when the pendant is disconnected.

Feed roller engage lever

Iron Tip Replacement (as needed)	The iron tips need to be replaced as necessary. You need to develop (as needed) a schedule to change the tips as they wear. The average life of the soldering tip is 50,000 - 60,000 points.

The tip is replaced by first powering off the machine. Once the tip has cooled down (3-5 mins.) gently grasp the tip while supporting the iron unit. Pull down on the tip until you feel it come loose. The tip is keyed and can only fit in the holder one way.

WARNING: *Make sure the temperature controller has been powered off prior to removing and / or replacing the solder tip. If the power is on the tip may burn out. Apollo Seiko will not replace tips that have been "blown" in this manner.*

The RSP iron tip heats up in less than three seconds. If the power is not OFF, the operator's fingers will be burned. Use a silicone rubber tube to grasp the tips when removing or inserting them. This will protect your fingers as well as give you a better grip on the tip.

Iron Tip Replacement (cont.)

Replace with a new tip by inserting the tip into the tip holder and sliding it into the tube until you feel it stop. Gently rotate the tip until you feel the key-way lock into position.

Again while supporting the iron unit, apply upward pressure until the tip locks.

> ***Note:*** *You should move the feed tube out of your way by loosening the locking nut and pulling the feed tube out of the way. Once you have inserted the new tip, slide the feed tube back into its lowest position and lock it into place.*

Feed Tube Replacement (as needed)

Upper Portion
Thumb Screw

Lower Portion
Thumb Screw

The solder feed tube will need replacing on an as needed basis. This is accomplished by loosening the thumb screw on the upper portion of the feed tube (feeder end) and pulling the tube out. The lower portion of the feed tube can be removed by turning the thumb screw on the iron end counter clockwise and removing the tube.
Simply replace the new feed tube by doing the reverse steps above.

Semi-Annual & Other Scheduled Maintenance

Stepper Motor Slide(s) (approx. 6 months)

Z & Theta axis cover

Y Axis Cover Plate

X Axis Cover Plate

The X, Y, Z & Theta axes of the robot are greased.
Remove the covers from the Z axis (above iron unit), the X axis (behind Apollo logo decal) and the Y axis (front to back cover behind the Z axis cover. There are slides which the moving axes travel on. These need to be greased semi-annually. The Theta axis is located under the same cover with the Z axis. The Z axis is a ball screw. Lubricate as necessary.

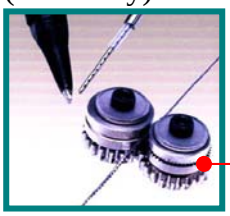
Lubrication: Use AFC or white, Lithium grease on the sides of the rails. Only apply a small amount, approx. 0.2 grams. Replace the covers once grease has been applied.

> ***Caution:*** a) *Do not apply grease to Kevlar drive belt(s).*
> b) *Power to the system must be disconnected.*

Cleaning Feed Rollers (bi-weekly)

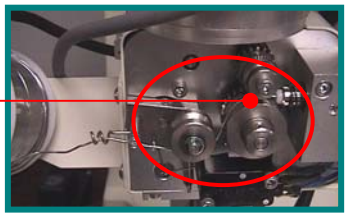
Occasionally the feed rollers will have build-up of solder particles. Simply use compressed air to blow the solder particles from the feed roller housing. Remove the solder from the housing area by lifting the feed disengage lever. Replace solder when complete, following steps above.

Cleaning Geyan/ZSB Micro-Gear (if applicable) (bi-weekly)



The micro-gear of the Geyan feed rollers will tend to build up with flux from the core of the solder wire. You will be able to see the flux residue. Use a light brush and flux cleaner to remove the flux from the gear teeth. Be careful not to bend or break the teeth of the micro-gear.

Micro-Gear – One Side Only

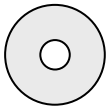


RS-P / RS-L Iron Unit (approx. 6 months)

Inside Cover

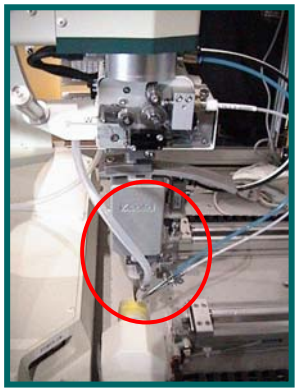
Grease bearings of cartridge holder and internal shaft of the iron unit. Remove the cover of the iron and lubricate moving parts. It may be necessary to clean with alcohol to remove flux residue prior to lubrication. The iron unit must be kept free from flux residue as this is the main cause for pre-mature wear & failure.

Silicone Ring (weekly – as needed)



Life is approx. 1 week. Replace as necessary. The heat of the iron tip will eventually wear the "grip" of the center of the ring. It will fall from position, replace approx. once per week.

Bofa Fume Extraction



The Bofa 200 fume extraction system has been installed on your system. There are two filters inside the main cabinet. There is a pre-filter and a Heppa filter. The life of the pre-filter will be 1~3 months and the Heppa filter approx. 6~9 months.

Bofa 200 Pre-Filter Heppa Filter

Checking Iron Tip for Wear

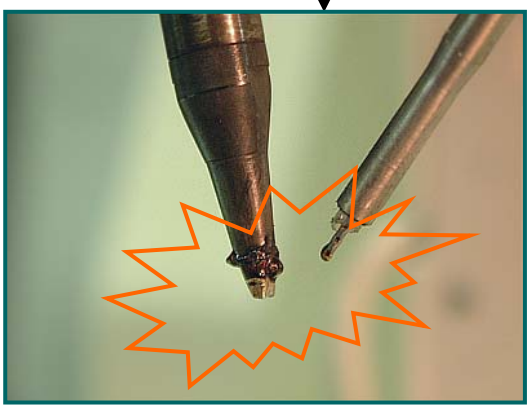
The iron tip will tend to corrode & oxidize more quickly if it is not kept clean and free of flux residue build-up on the tip. The molten solder & liquid flux are removed upon air jet cleaning. Burnt flux residue, black in color will build up above the tin / lead plated area of the tip. This needs to be removed with a sponge and / or "Orange" wood stick approximately one time per hour.

While the robot is in the home position, loosen the compression nut that locks the feed tube in place. Pull the feed tube back so it is out of the way. Use a wet sponge or an "Orange" wood stick to scrape the black flux residue from the tip. Make sure the iron tip is clean prior to returning the feed tube to the solder position. Re-tighten the compression nut and return to normal operation.

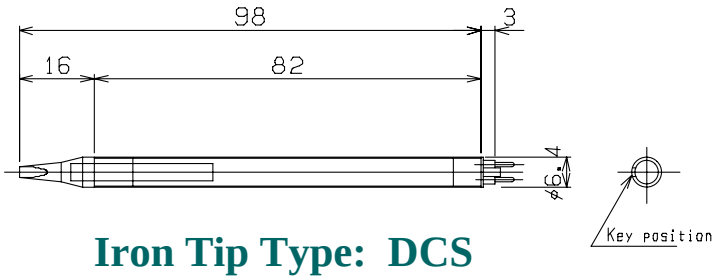
Corroded TM Iron Tip

Has a hole worn into the surface because the tip has been in use too long.

Black Flux Residue – Remove with a wet sponge or an "Orange" wooden stick



Iron Tip Dimensions



Iron Tip Type: DCS

L-CAT EVO Maintenance

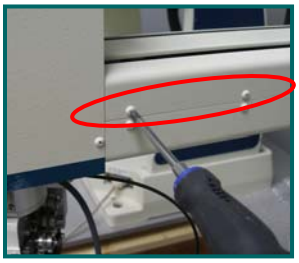
Date: March 01, 2007

Maintenance Item: Tightening X & Y Axes Set Screws, Pulleys etc.

1

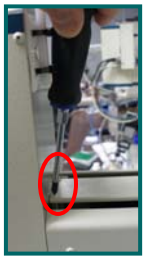
Remove X Axis Cover Plate (Bottom 4 Phillips Screws)

2



Remove Y Axis Side Plate (Side 6 Phillips Screws)

3

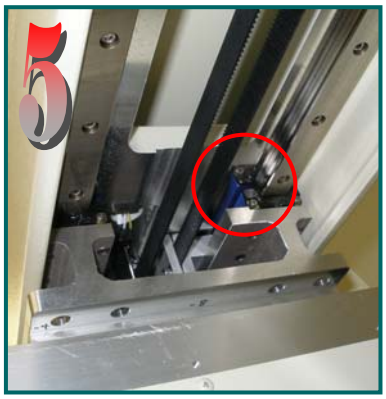


Remove Y Axis Top Plate (2 Phillips Screws)

4

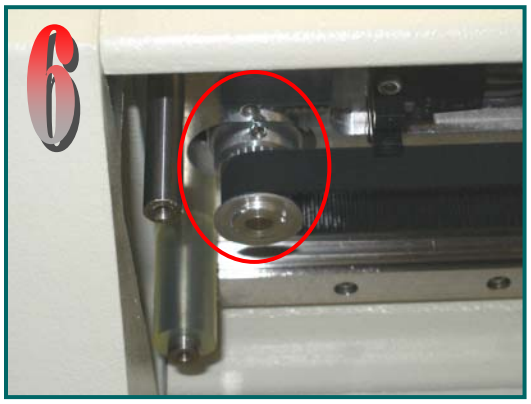
Remove Y Axis Motor Plate (Bottom 2 Phillips Screws & Side 2 Phillips Screws)

5



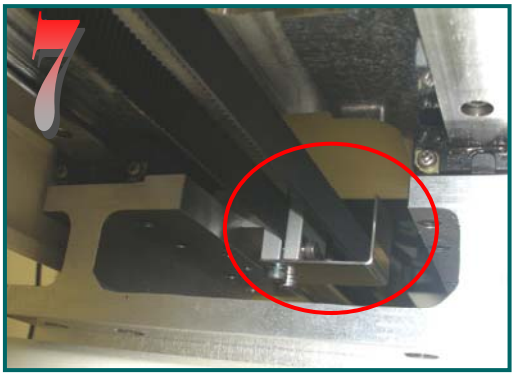
Ensure (X) Belt is Tight to Carrier

6



Tighten Set Screw on Left Side Sprocket (X)

7



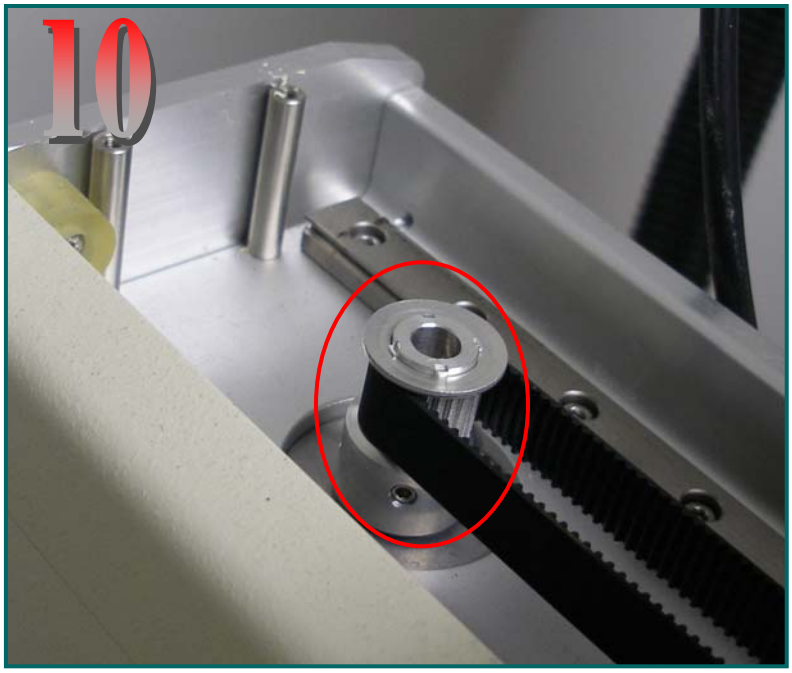
Ensure (X) Belt is Tight to Carrier & Sensor Arm is Tight to Carrier

8

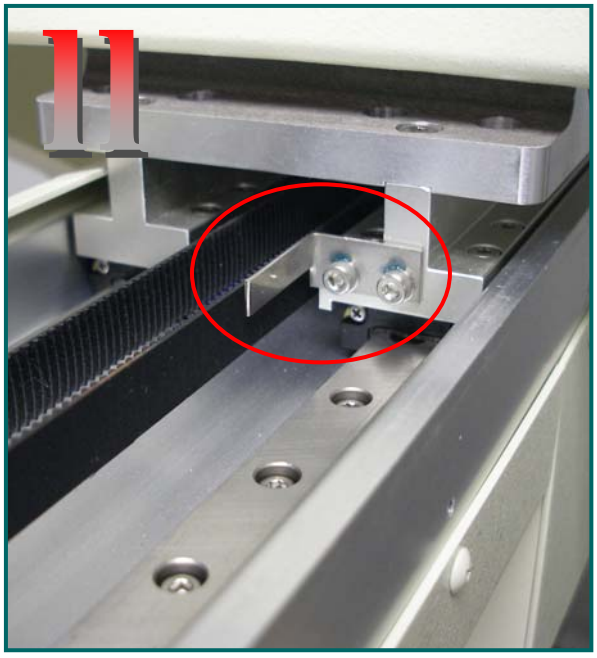
Tighten Set Screw on Right Side Sprocket (X)

Apollo Seiko L-CAT EVO X & Y Axes Adjustments

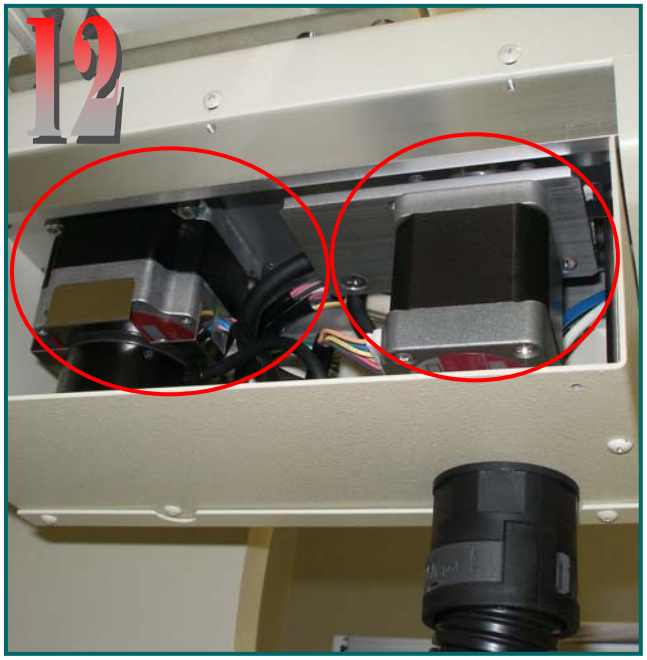
Tighten Set Screw on Front Side Sprocket (Y)



Tighten Set Screw on Rear Side Sprocket (Y) (back of robot)



Ensure (Y) Belt is Tight to Carrier & Sensor Arm is Tight to Carrier



Ensure that Motor Mounting Screws are Tight to Plate (lower, rear of Y axis)

L-CAT EVO Maintenance

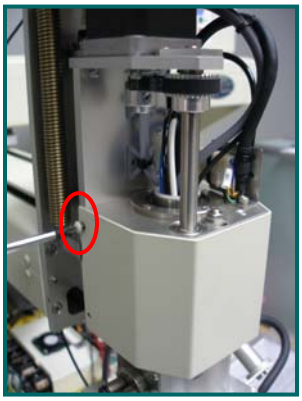
Date: March 01, 2007

Maintenance Item: Tightening Z & Theta Axes Set Screws, Pulleys etc.

1

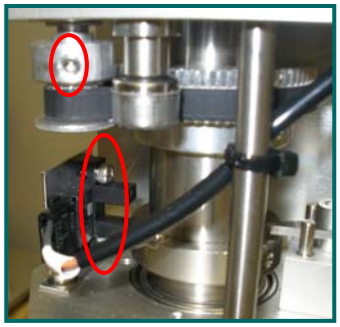
Remove Z Axis Cover Plate
(5 Phillips Screws)

2



Remove Theta Axis Cover Plate
(4 Phillips Screws)

3

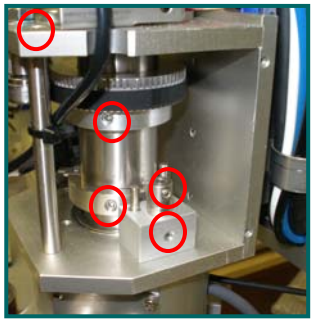


Tighten Set Screw on Sprocket and Also Ensure that Sensor Screws are Tight

4

Tighten Set Screws as Shown

5

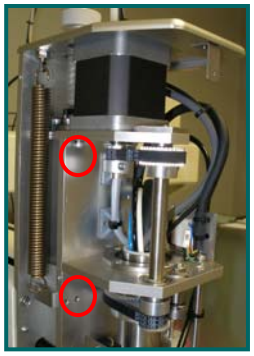


Tighten All Set Screws as Shown

6

Tighten Set Screw on Z Axis Upper Shaft Cap

7



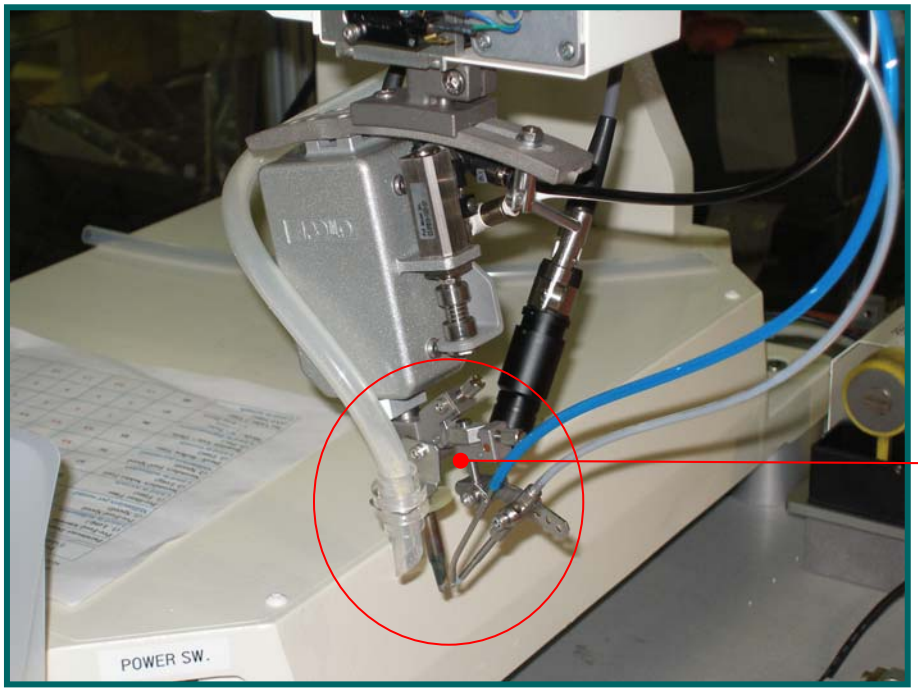
Tighten the Screws that Tie the Aluminum Back Plate to Main Assembly

8

Ensure that the Sensor Mounting Screws are Tight
(do not over-tighten)

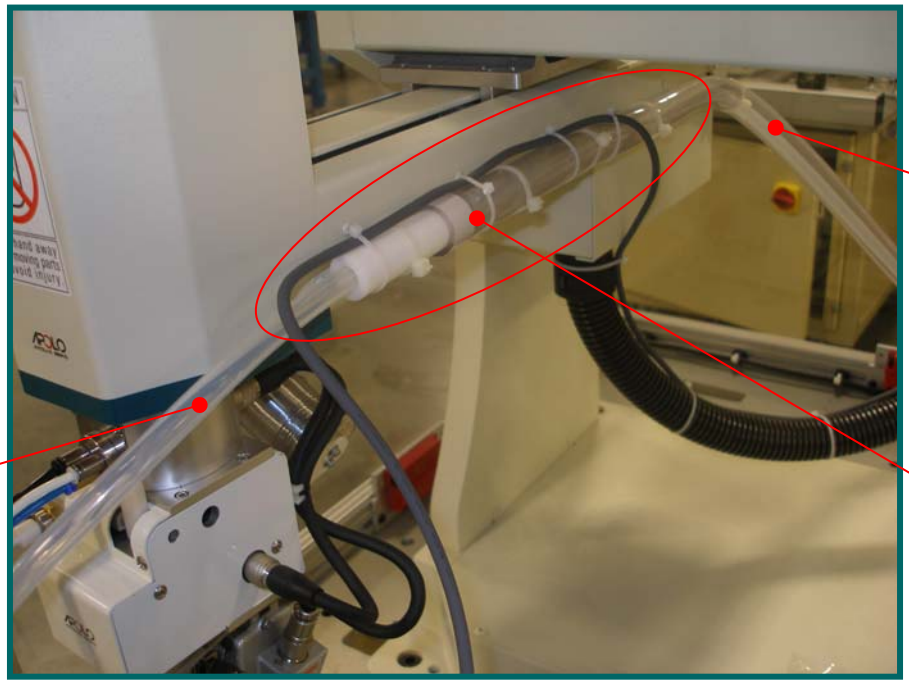
Fume Extraction Tube Routing

Date: **Feb. 06'**



Bolt the Tube Holder to the RS Iron Unit

Attach Tube Holder to RS-P / RS-L Iron with M3 Screw



25mm Plastic Tubing

Route to Fume Extraction System

11mm Silicone Tubing

Insert Into Nylon Connector

Nylon Connection Sleeve

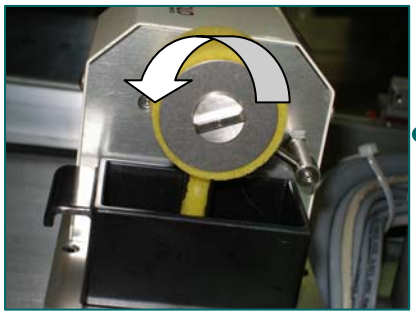
Insert 11 mm tubing all the way through & into the 25 mm tubing to prevent "clogs"

Route Tubing as Described in the Photo Above

Technical Advisory

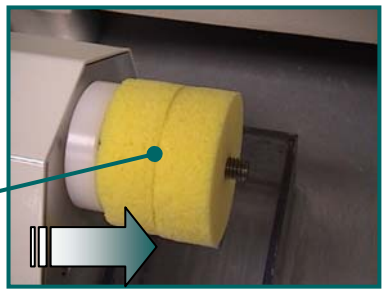
Aug. 17, 07

SRC 2000 Sponge Change



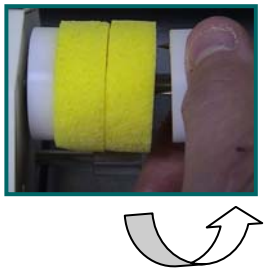
Step 01:

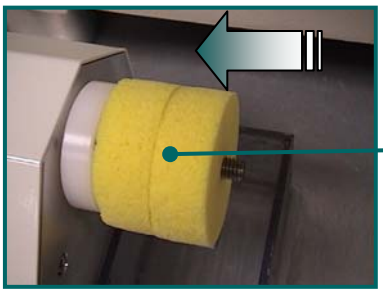
Loosen & remove the metal support on the right hand side of the SRC 2000 by turning it counterclockwise.



Step 02:

Remove sponges by pulling them off of their mounting shaft.



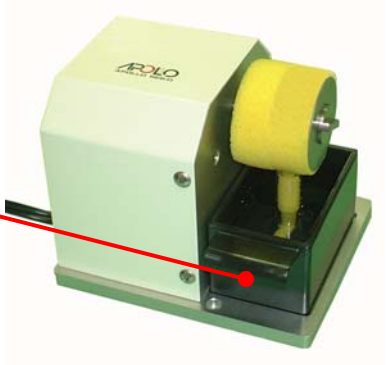


Step 03:

Replace sponges with new ones by installing onto shaft. Reinstall metal support and hand tighten to "stop" position.

Step 04:

Check water level and fill between 2/3 & ¾ full with regular tap water. Replace reservoir



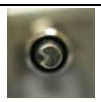
Apollo Seiko Recommended Spare Parts List

L-CAT EVO Robot with ZSB Feeder
DCS Iron Unit
BOFA Fume Extraction System

April 2007

Note: We encourage blanket orders on soldering tips, delivery 4-6 weeks A.R.O.

Soldering Iron Tips

Part Number	Description	Unit Cost	Qty. To Stock
DCS-DCN (DCN With N2 nozzle) 	Iron Tip	$94.02	5~11

Qty.	% Discount	Qty.	% Discount
01 – 10	00%	11 – 50	05%
51 – 75	07%	76 – 100	10%

Wire Feeding Unit

Part Number	Description	Unit Cost	Qty. To Stock
TAL0.65-650 S**60**	Feed Tube for L-CAT with ZSB Feeder TM-P Point Solder Iron	$82.95	03
CON-RSP 400	Iron Cable (robot to solder head)	$138.21	01
L-CAT EVO ZSB CABLE 250	ZSB Solder Feed Cable	$158.00	01
ZSB-1.0-001B	ZSB Roulette Blade	$207.38	01
ZSB-1.0-002R	ZSB Guide Blade	$155.49	01
ZSB Feeder	ZSB Feeder for L-CAT EVO	$1890.00	--
146-2GT-4	Driving Belt ZSB Feeder	$11.85	01

Soldering Head Unit

Part Number	Description	Unit Cost	Qty. To Stock
RING	Rubber Ring For TM Iron (flux deflection)	$5.56	10
RS-P / N2 RS-P	Solder Iron	$2686.00	--

*In a multi-machine environment we recommend each customer have one spare iron unit in-house in case of an emergency.

Miscellaneous

Part Number	Description	Unit Cost	Qty. To Stock
TUBING	Blue, White & Black Air Tubing Set	$34.85	01
SRC-2000	Electric Tip Cleaning Unit	$1,039.58	--
SRC-1006	Sponges for tip cleaner (Pkg. 10)	$37.09	02
X-AXIS BELT-L	X-AXIS Belt for L-CAT	$43.27	01
Y-AXIS BELT-L	Y-AXIS Belt for L-CAT	$43.27	01
702-2GT-6	Timing Belt, Z Axis	$23.70	01
168-2GT-6	Timing Belt, Theta Axis	$23.70	01
120-2GT-6	Timing Belt, Theta Axis Motor	$23.70	01
CDJPB10-10D-97	Cylinder & Sensor's w/Led's	$444.25	01
RBI-RSP	Sensor only w/Led	$50.00	02
EVO CPU BOARD	L-Cat EVO **CPU** Board	$2962.50	--
EVO PCB	L-Cat EVO **P**ower **C**ontrol **B**oard	$1382.50	--
EVO PSB 24V	L-Cat EVO Power Supply Board 24V	$493.75	--
EVO PSB 48V	L-Cat EVO Power Supply Board 48V	$493.75	--

Note: These prices are subject to change without notice.